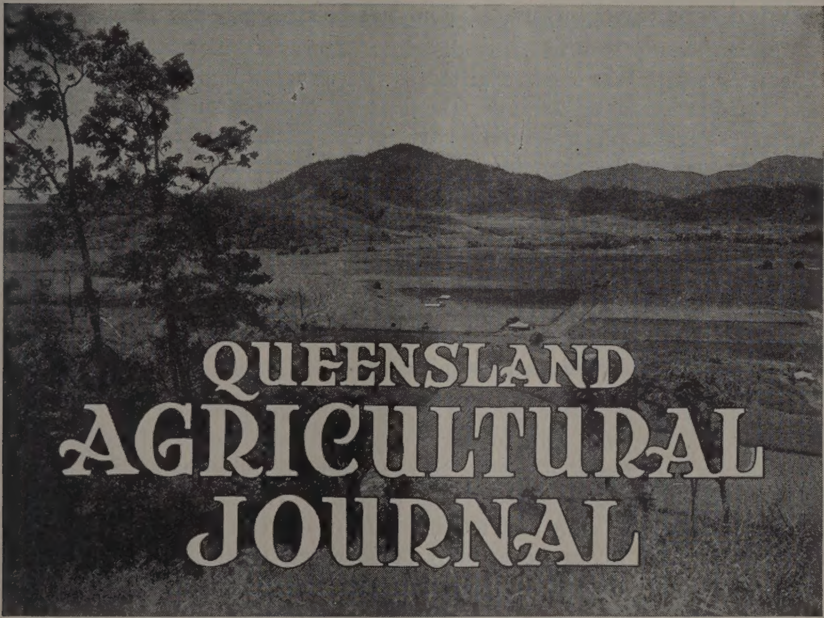
ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. LVI. 1 SEPTEMBER, 1941 Part 3

Event and Comment

Vigilance for Victory.

IN the Old Country a Vigilance for Victory Group is busy linking up war efforts with post-war plans. Collaborating with the Vigilance for Victory Group is a Political and Economic Planning Group, and in keeping with its initial letters P.E.P., it is putting plenty of "pep" into the national cause.

Informed, searching, and constructive criticism is a characteristic of these live-wire units in Britain's planning campaign, and they accept no excuse for slackness in their particular fields. They are, in effect, a sort of observer corps to the fighter command, watching each situation as it develops in their own special sphere, and losing no time in mobilising expert opinion and determination to consider and recommend effective courses of action to the authorities.

From our own experience in the present war, and also from our own experience since the last war, we shall obviously have to prepare for and, if practicable, evolve or establish a new technique in our national economy. What has to be done is to see that "the framework of scientific co-operation and organisation is adequate both to the demands of war-time and to the reconstruction to follow."

In the foregoing is a suggestion of a double-barrelled slogan: Vigilance for Victory; Political and Economic Planning for Peace.

The Unwise Use of Land.

LACK of wisdom in the use of land has been largely the cause of serious loss of soil in many districts. Here is a picture of a stretch of country which was once regarded as rich grazing land; in fact, it was once considered to be amongst the best of our pastoral territories:—"Great stretches are absolutely bare, overstocking has resulted in the disappearance of the permanent grasses, and with little to hold the top soil together it has gradually washed away. The erosion has been going on for a number of years, and, perhaps, has been imperceptible, but the facts are there for anyone with knowledge of the land to see."

There it is—some parts of the country with richly soiled slopes have been eroded to ribbons and on which, even after good soaking rain, the feed can only be classed as goose picking.

Even after successive good growing rains, the grass on this country has failed to respond, and to-day many paddocks look as though they are showing the effects of a very severe drought, notwithstanding heavy and continuous rains in summer and autumn. In contrast to this scene of desolation, in the same district there are properties on which perennial grasses have been given a chance by being wisely stocked, and which are now carrying an abundance of feed.

This is how a well-known and successful grazier has put it: "One of the greatest evils in Australia is the overstocking of our grazing lands. On sheep-to-the-acre country the sound policy is to run only one sheep to an acre and a-quarter, the quarter being a reserve against drought. This is cheap insurance that pays a wonderful dividend."

Standardization of Farm Equipment.

THE visitor to many farms is impressed by the aggregation of farm implements and machinery—all necessary for efficient working—on every holding. The practicability of standardizing all this farm equipment seems to be well worth inquiring into. It is not supposed that many farmers have given more than a passing thought to the work of the Standards Association of Australia, yet standardization, especially as applied to agricultural equipment, offers a real economy. Up to the present, the Standards Association has made rather slow progress in its attempt to establish some measure of standardization in respect of the wearing parts of farm machinery, but that, it has been asserted, is not the fault of the association. Standards for farm building, fencing, and other materials have been fixed for some years, but although these measures of standardization directly benefit the farmer, they are not, apparently, widely known. On the Agricultural Machinery Committee of the Australian Standards Association are representatives of primary producers, as well as of machinery manufacturers, and this committee has been trying for years to standardize various plough parts; although draft or final standards have been issued for cultivator points, knife sections of Australian mowers and binders and sprocket chains. Threads

of grease cups and nipples and nuts and bolts for general use in agricultural machinery are items now awaiting the work of other committees.

Two other things of importance to the farmer are plough discs and pneumatic tyres. The extraordinary number of discs in use raises the question as to why so many sizes are regarded as necessary. However, an attempt is being made to do away with a number of inconvenient sizes, and to simplify the method of attachment.

It has been observed that pneumatic tyres for implements are becoming more popular. There is no doubt that they reduce the draft of the implements to which they are fitted, and are better than steel wheels for most purposes; but they will not be used as widely as they might be if a farmer has to have a separate set of tyres for each outfit, which he may use only for a few days or a few weeks in the year. The difficulty could be got over easily by specifying a standard set of, say, discs and tyres that could be attached easily to the various implements as they are required. All implements could not, of course, be so fitted, but still the number that could be so fitted is surprising, and there would be much more economy in the use of pneumatic tyres if one set of wheels could thus be made to serve a whole farm.

When the need for standardizing a certain article crops up, it is suggested that the Standards Association should be asked to consider it. A community request for standardization along certain lines from a local farm group or, say, the Council of Agriculture, would be better still. That would be one way of establishing a valuable form of co-operation between the primary producer and machinery manufacturer, and standardization of common machinery parts would benefit everyone concerned. Standardization would also prevent waste—and waste is an enemy in peace or war.

The Rural Scene in Britain.

THE farmers of Britain have changed the face of their country and changed it in less than a couple of years. Green swards of grassland unbroken by the plough for many a long year have disappeared and deep, brown furrows in endless rows are now the most impressive landscape features. This is the best of evidence that rural Britain is wide awake and playing once more its full part in the life of the community. Increasingly, grassland is going under the plough. The land is growing more food and farmers are putting their full weight into winning the war. Sound farming practice is the rule on every acre within the farm fences and the foundation of a new era of rural prosperity, based on healthy soil, when peace returns is being well and truly laid. And this new era will bring, it is believed, a sounder rural economy which will check the drift to the cities; so, whatever else may happen, "the nation will be richer in happiness and good life by having put to nobler use the land—the first asset of mankind."

Sheep Blowfly Control.

SCHOOLS OF INSTRUCTION.

FOR a number of years research into the sheep blowfly problem has been actively prosecuted. Notwithstanding the fact that the results of this work have been reported in scientific and popular publications, the losses caused by blowfly attack are still serious indeed.

On reviewing the position, the Joint Blowfly Committee, representative of the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture, felt that the methods of dealing with blowfly were not sufficiently known and their value not sufficiently appreciated.

Arrangements were therefore made to conduct special schools of instruction at the Animal Husbandry Farm near Sydney, and these were attended by scientific officers from all States, including four from the Queensland Department of Agriculture and Stock.

In order to disseminate as widely as possible the knowledge gained by these officers, a further school was held at the Animal Health Station, Yeerongpilly, from 5th to 8th August, 1941.

Opening of Yeerongpilly School.

In officially opening the Yeerongpilly School, the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) said that on such an occasion he realised the necessity for co-operation as between the various component parts that work together to find a solution to a problem. Here was an example of that co-operation in its most practical application; the Council for Scientific and Industrial Research, the State and the University on the one hand, and on the other those whom it was sought to serve—the graziers.

Probably one of the greatest difficulties with which scientific bodies were confronted was not so much the magnitude of the problem in the laboratory, but the task of getting that knowledge out to the layman. He had long pondered on the possibility of setting up some form of organisation to translate the achievements of the laboratory to the practical man and make them applicable to industry. There was a tremendous volume of knowledge on the problem of blowfly control that had never been applied.

He believed the average grazier was keen to learn and frequently asked, "Where can I get the information I need?" There was another school of thought which adopted the attitude that when the fly came along it was "just too bad," and soon the fly would go away and everything would be well. That type of individual was a menace to the industry.

Preventable economic loss in industry, continued the Minister, was one of the big problems which we as Australians have to tackle. We were fortunate when we compared our position with that existing in other countries, but it was true that because we enjoyed some measure of immunity from the more serious, dangerous, and mortal diseases of stock, we were apt to under-estimate the seriousness of the things in our midst.

Plate 37.

AT THE OFFICIAL OPENING OF THE BLOWFLY SCHOOL.

It was planned, by continuous rippling such as occurs when a stone is thrown into a pond, to set up a nucleus of information at this school and to expand that to other schools to be held in the worst fly-infested areas of the State.

There had been a tendency for the laboratory man to divorce himself from the public. Perhaps that did not apply in Queensland to the same extent as in other places. The School of Veterinary Science of the Queensland University was established—and deliberately established—in conjunction with the animal health services of the State to ensure the widest distribution of knowledge and to prevent the animal health services from becoming self-centred and self-sufficient and the University from sitting in its own corner without working in conjunction with the Department.

Plate 38.
DEMONSTRATING BREACH CONFORMATION WHICH PREDISPOSES TO FLY STRIKE.

The Council for Scientific and Industrial Research, which had carried out a great deal of research work on the blowfly problem, was anxious to make available the knowledge resulting from this work. It was interesting to record that the recommendation from the Standing Committee to the Australian Agricultural Council, that each State send delegates to a central blowfly school, was carried without debate. It was adopted unanimously by every Minister for Agriculture in Australia. The whole scheme was being financed to some extent by the Australian Wool Board, which had provided a sum of £600. The State would have to supplement that amount materially to carry out the project to a successful termination.

At one time, said Mr. Bulcock, he had asked a friend of his associated with the University of Queensland to give him in round figures the monetary value of preventable economic loss in Queensland, and he was amazed when a figure of some £10,000,000 was returned. It meant that Queensland industries were contributing £10,000,000 for which they received no dividend, and it became an overhead charge against those industries.

He had no doubt that Queensland's maximum economic loss was found as a result of tick infestation and blowfly damage. The losses caused by blowfly could be reduced considerably, not by difficult methods and costly methods, not by methods requiring laboratory determination for their application, but, so far as he could understand, by common-sense methods which the average man with ordinary intelligence could apply. Because that was so he welcomed this school. He believed it would be the forerunner of many of a similar character.

Plate 39.

This Demonstration at the Blowfly School Attracted Keen Interest.

There were many other problems confronting our primary industries, and if this proved to be the right way of carrying knowledge from the research organisation to the man earning his livelihood by participation in industry, then it would prove of great assistance to primary producers.

Every Departmental officer stationed in areas where the blowfly pest presented itself should have up-to-date knowledge in respect of the preventive and curative stages of treatment. If, having trained these officers, the Department succeeded in passing the information on to the graziers and selectors, it would be an encouragement to carry on.

If, however, there was no hearty co-operation by the graziers and selectors, it would be most difficult to proceed further. At this time of financial stringency expenditure could not be incurred needlessly and finances dissipated.

The first duty of those attending the school, continued the Minister, was to apply the knowledge gained in their own practices. Their second duty was to see that that knowledge was as widely distributed as possible. The theory that Governments should be held entirely responsible for all forms of technical education must break down under the urge of present times.

Plate 40.
JETTING SHEEP IN ELEVATED JETTY RACE OF THE TANONGA TYPE.

In conclusion, Mr. Bulcock extended congratulations to those who made the school possible. Although the Council for Scientific and Industrial Research had been criticised from time to time, it was frequently because its critics had only a limited knowledge of its wide ramifications. He thought that the Council for Scientific and Industrial Research, by its action in making the school possible, had contributed materially to the wellbeing of the nation.

Instructional Programme.

The course of instruction at the Yeerongpilly School was a very comprehensive one, and included both the theoretical and practical aspects of blowfly control. After discussing the relative importance of the various species of blowflies concerned in strike and the possibilities of their control by trapping, poisoning, and biological methods, attention

was given to the various factors which are now known to predispose sheep to blowfly attack. Measures to reduce immediate susceptibility, such as jetting, crutching, and the Mules operation, received special attention.

Each officer was given the detailed theory of the various control measures, and also had an opportunity of becoming familiar with the pactical side through personal practice. Jetting plants supplied by courtesy of various Brisbane pastoral firms were displayed and their operation explained. Demonstrations were also given of the significance of wrinkly breech, faulty withers, and bad types of wool in the predisposition of the sheep towards blowfly attack.

Dr. L. B. Bull and Dr. A. J. Nicholson, Chiefs respectively of the Divisions of Animal Health and Economic Entomology of the Council for Scientific and Industrial Research, whose visit coincided with the period of the school, addressed the school and were able to impart valuable information secured through the researches of their respective divisions.

Country Schools.

A school for Departmental officers is to be held at Blackall, and arrangements have been made, in co-operation with the United Graziers' Association and the Selectors' Association, to hold four two-day demonstration schools for sheepowners and others who are concerned in dealing with sheep blowfly. These are set down as under:—

Blackall	11th and 12th September.
Longreach	16th and 17th September.
Winton	23rd and 24th September.
Julia Creek	29th and 30th September.

To all attending these demonstration schools suitable printed material is being issued, so that they may have details for later reference.

THE NASAL FLY—A SERIOUS PEST OF SHEEP.

During the spring and summer months, graziers in many parts of the State may be puzzled for an explanation as to why their sheep, for no apparent reason, suddenly gallop round the paddock, or stand in bunches with their faces buried in each other's wool, or held very closely to the ground. If such a group is watched closely, the attitude of the animals will be seen to be due to the presence of a stout, greyish fly, which frequently is to be seen during spring time and early summer resting on the fly screens and water tanks around the homestead. This is the sheep nasal fly, which lays its maggots on the edges of the nostrils of the sheep. The action of the animals in burying their noses in the wool of other sheep, or in the soil, in an endeavour to protect them from the flies, is readily understandable.

The maggots, after they have been laid by the female fly, crawl up the sheep's nostrils and into the communicating cavities. Here they remain for several months. Being provided with a pair of stout hooks in the region of the mouth, they attach themselves to the lining of the nostrils and cause the secretion of much pus-charged mucous, on which they feed. The condition in sheep known as "snotty nose" is due to the presence of these maggots, which may also be responsible for such a severe irritation that the infested animal loses condition.

Control of the sheep nasal fly is not very effective at present, but much good can be done by daubing the animals' noses at frequent intervals with Stockholm tar. This procedure should be especially carried out between October and January, inclusive, when the flies are most numerous.

Green Manuring—Stanthorpe Investigations, 1937-40.

KEIGHLEY M. WARD, M.Agr.Sc., Research Officer.

IT is generally recognised that the addition of organic matter improves most soils because of the effect produced on their chemical, biological, and physical properties. The practice of ploughing-in green manures has consequently come to be looked upon as of fundamental importance in many branches of horticulture and agriculture. Considered broadly, the principal effect of the addition of organic matter to the soil is to increase the availability of nutrient elements which are naturally present in the soil, or which have been added as artificial fertilizers.

In general, the soils of the Stanthorpe district are low in organic matter in the virgin state, and continuous cultivation leads to the rapid depletion of their humus content. The building up and maintenance of a supply of soil organic matter thus forms one of the most important of a group of operations that are fundamental to the proper nutrition of crop plants in this district. There are many difficulties, however, brought about mainly by climatic and soil factors, which limit the growth of green manures at Stanthorpe, and in consequence satisfactory crops of green manure are not common, the yield of green matter generally ranging from 1 to 4 tons per acre. This is inadequate, and the position definitely calls for improvement. Such an improvement can be expected only when important climatic and soil factors are given due consideration.

The climate of the district is characterised by an annual rainfall of 30 inches, 40 per cent. of which falls in the autumn and winter months, the latter season usually being the driest period of the year. Rainfall is rather uncertain in all seasons, and periods of little or no effective rain occur fairly frequently. This and a high rate of evaporation sometimes cause sufficient drying out of the soil to restrict the growth of crops, and the need for the employment of moisture conservation practices in all branches of local farming requires little stressing. Winter frosts, which are numerous and severe, are another climatic feature of the district; over a period of thirty-four years the mean minimum air temperatures for June, July, and August have been 36·6 deg., 33·2 deg., and 35 deg. F., respectively, whilst during this period minimum grass temperatures have occasionally reached 6 deg. F.

The soils of the district consist of decomposed granite, and are generally of a coarse-grained, sandy texture. After rain, they almost invariably form a rather hard surface crust, which is partly attributable to lack of organic matter. The level of fertility of these soils is such that successful crop production, including the growing of green manure crops, depends largely on the judicious use of fertilizers, for plants growing in them frequently exhibit deficiencies in major and trace elements, lack of nitrogen being particularly evident.

From the foregoing it is apparent that successful cultivation of green manures in the Stanthorpe district depends very largely on supplying nutrient elements in which the soil may be deficient and planting varieties that are drought and frost resistant. Since 1937, various aspects of the green manuring problem have received attention,

and this article deals with that part of the work concerned with determining the nitrogen, phosphoric acid, and potash requirements of green manure plants, and with the testing of potentially suitable varieties. On account of the necessity for conserving moisture during the main growing season, attention has been focussed chiefly on winter green manure crops.

FERTILIZER EXPERIMENTS.

During the past four years a series of fertilizer experiments has been conducted on cereal and leguminous crops. The experiments were laid down in apple orchards which differed with respect to the age and condition of the trees, soil types, and location in the district, and were set out in designs which allowed statistical examination of all quantitative data. The size of the plot adopted throughout the work was 60 feet by 15 feet, and the yield of green matter was measured by cutting and weighing ten 1-square-yard random samples in each plot. Prior to sowing, the land was ploughed and harrowed, the fertilizers usually being turned under in the ploughing process; the seed was then broadcast and harrowed in. Sometimes the fertilizers and seed were broadcast at the same time and then covered. In ensuing months, observations were made on the rate of growth and general condition of the crops, and the samples were taken immediately before the plants reached the flowering stage.

1937 Experiments.

In 1937, two experiments were conducted at The Summit in a nineteen-year-old orchard in which the trees, although not very vigorous, had previously made good growth and were still bearing satisfactory crops. The soil had received moderate applications of mixed fertilizers in previous years. The plants employed were Florence wheat and New Zealand blue lupins. The value of the 4·76 inches of rain that fell during the four-month growing period of the plants was considerably reduced by its unsatisfactory distribution.

TABLE 1.

Showing the Influence of Fertilizers on the Yield of Green Matter of Florence Wheat and New Zealand Blue Lupins. The Summit, 1937.

Treatment.	Rate of Application in Cwt. per Acre.	Yield of Green Matter in Tons per Acre.	
		Wheat.	Lupins.
1. N—Sulphate of ammonia	2	3·33	2·44
2. P—Superphosphate	2	1·25	1·13
3. K—Sulphate of potash	2	1·47	1·31
4. NP—Sulphate of ammonia and superphosphate	2, 2	4·14	2·65
5. NK—Sulphate of ammonia and sulphate of potash	2, 2	3·76	2·14
6. NPK—Sulphate of ammonia, superphosphate, and sulphate of potash	2, 2, 2	4·19	2·65
7. KMg—Sulphate of potash and magnesium sulphate	2, 1	1·15	1·21
8. No fertilizer	..	1·17	1·20
Standard errors	..	0·236	0·199
Significant differences	..	0·68	0·58

The results of the experiments (Table 1) show that, in so far as wheat is concerned, all treatments in which nitrogen was included gave

considerably greater yields than those from which nitrogen was omitted (Plate 41). These latter treatments, Nos. 2, 3, and 7, produced no increased growth response whatever when compared with untreated plots. Another feature of the results was that plots receiving superphosphate with sulphate of ammonia (*i.e.*, treatments 4 and 6) showed a definite increase in yield when compared with those receiving sulphate of ammonia only. It was evident, too, that the addition of potash to the mixture of sulphate of ammonia and superphosphate did not lead to a further increase in yield. In general, plots which received nitrogen produced three times as much green matter as those to which nitrogen was not added.

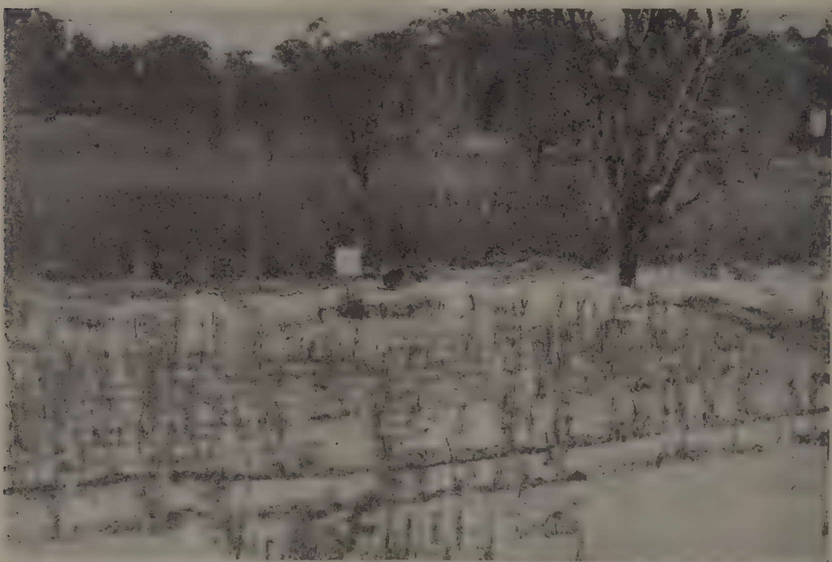


Plate 41.

PLOT OF FLORENCE WHEAT.—Plot of Florence wheat in foreground received 2 cwt. superphosphate per acre and yielded 1.3 tons per acre. Plot in background received 2 cwt. sulphate of ammonia per acre and yielded 3.5 tons per acre. Marked response on latter plot occurred despite dry weather.

Somewhat similar results were obtained when the same treatments were applied to lupins. Here again, all plots in which nitrogen was present yielded considerably more than those from which it was absent, and the latter actually produced no more green matter than unfertilized plots. In the case of lupins, however, sulphate of ammonia was as effective alone as when combined with any of the other fertilizers. Neither superphosphate nor sulphate of potash, used either alone or in combination, brought about any increase in yield. Lupin plots receiving nitrogen produced double the amount of those not receiving this element.

It is noteworthy that, despite the occurrence of unfavourably dry weather conditions, the influence of the effective fertilizers was felt in a marked degree as can be seen from Plate 41.

1938 Experiments.

The site of the 1938 experiments was a non-bearing, three-year-old apple orchard in which vegetables had been grown for some years, during which time the soil had received applications of sheep manure and sulphate of potash. In these experiments the plants used were Black Winter rye and New Zealand blue lupins, which are later usually referred to simply as rye and lupins respectively. During a growing period of five months the plots received a well-distributed rainfall of 8·14 inches.

TABLE 2.

Showing the Influence of Fertilizers on the Yield of Green Matter of Rye and New Zealand Blue Lupins. The Summit, 1938.

Treatment.	Rate of Application in Cwt. per Acre.	Yield of Green Matter in Tons per Acre.	
		Rye.	Lupins.
1. N_1—Sulphate of ammonia	1	8·95	2·75
2. N_2—Sulphate of ammonia	2	9·97	3·35
3. NP—Sulphate of ammonia and superphosphate	2, 2	8·68	5·08
4. NK—Sulphate of ammonia and sulphate of potash	2, 2	9·24	2·79
5. PK—Superphosphate and sulphate of potash ..	2, 2	6·01	2·11
6. NPK—Sulphate of ammonia, superphosphate, and sulphate of potash	2, 2, 1	9·60	3·50
7. Ca—Lime	3	5·95	1·72
8. NCa—Sulphate of ammonia and lime	2, 3	8·76	4·02
9. No fertilizer	..	5·29	3·30
Standard errors	..	0·777	0·524
Significant differences	..	2·27	1·53

The treatments given and the results obtained in this experiment are presented in Table 2. This table shows that in the rye plots the three treatments from which nitrogen was excluded, *i.e.*, Nos. 5, 7, and 9, gave similar yields, all of which were significantly lower than those given by the other six treatments in which nitrogen was included. There were no significant differences between any of these six latter treatments. The application of 1 cwt. of sulphate of ammonia per acre in treatment 1 in this orchard was practically as effective as the 2 cwt. in treatment 2, and sulphate of ammonia gave as great a response when used alone as when combined with other fertilizers. The results obtained were undoubtedly influenced by residues from fertilizers used previously in the orchard. Plots receiving nitrogen made excellent growth, the plants commonly attaining a height of 5 feet (Plate 42). Lupins yielding a comparable amount of green matter in a varietal experiment in the same year were only 15 to 18 inches in height (Table 3 and Plate 52). This height factor is important in connection with the effective ploughing-in of the crop.

With respect to the lupins, the results were somewhat affected by factors other than the fertilizers, and in particular poor drainage in some plots was no doubt responsible for the high variation in the yields obtained. Under the conditions prevailing, sulphate of ammonia, together with superphosphate, in treatment 3 produced a marked increase in the yield of lupins. This treatment was significantly superior to all

others excepting the nitrogen-lime combination in treatment 8, but since the latter treatment did not give a significantly higher yield than the unfertilized plots, no great importance can be attached to it. The yield of lupins in limed plots was actually less than in unfertilized plots.

Plate 42.
WELL-GROWN CROP OF RYE FOR GREEN MANURE.—This plot received 2 cwt. sulphate of ammonia per acre and yielded 10 tons per acre.

1939 Experiments.

Prior to the 1939 experiments, the fertilizers had been applied in approximately balanced proportions—*i.e.*, equivalent amounts of nitrogen, phosphorus, and potash had been given. It was now considered desirable to discover the effects of the fertilizers when combined in varying proportions. Accordingly, in 1939, experiments were designed to study the effects on green manure crops of a nitrogenous fertilizer, superphosphate, and sulphate of potash when applied at three different levels or rates of application, and in all possible combinations with each other. Four factorial experiments were laid down in the autumn of 1939, one on rye and one on Dun field peas, in each of two widely separated parts of the district, viz., Cottonvale and Glen Aplin. The soil types of these areas differ somewhat; that at Cottonvale showing evidence of having passed through an alluvial phase, though it is of granitic origin, whilst that at Glen Aplin is a typical residual granitic soil. The experimental blocks were laid down in nineteen-year-old apple orchards, both of which were showing marked effects of depleted soil fertility. The treatments applied and the rates of application at Cottonvale were as follows:—

Fertilizer.		Level.		
		0	1	2
N = Nitrate of soda	Cwt. per acre	0	1¼	2½
P = Superphosphate	Cwt. per acre	0	1	2
K = Sulphate of potash	Cwt. per acre	0	½	1

At Glen Aplin, the treatments given were the same except that sulphate of ammonia replaced nitrate of soda as the source of nitrogen, and was used at the rate of 0, 1, and 2 cwt. per acre. During the four-month growing period a well distributed rainfall amounted to 6.56 inches.

Responses on Rye Plots.

An analysis of the samples showed that highly significant results were obtained in both experiments on rye. The main results from the Cottonvale plots are expressed in Plate 43, which shows the interactions of the three fertilizer materials at the various levels of application.

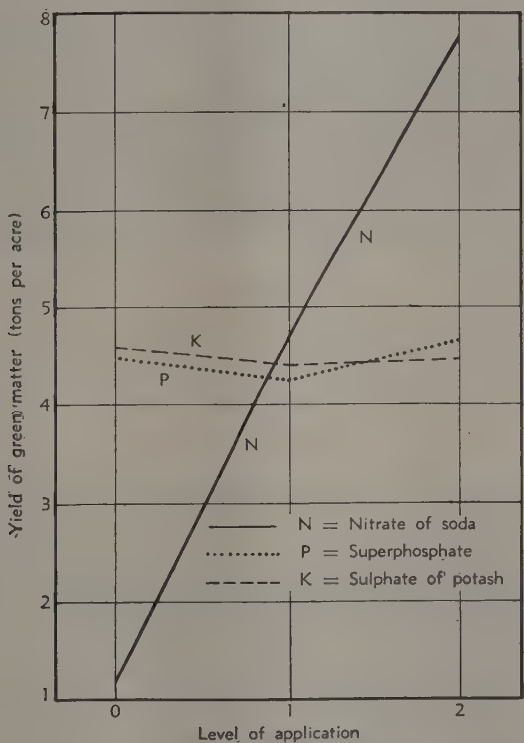


Plate 43.

FERTILIZER EXPERIMENT AT COTTONVALE, 1939.—Showing interactions between nitrate of soda (N), superphosphate (P), and sulphate of potash (K) on rye plots.

There was a most striking response to the 1¼ cwt. and 2½ cwt. levels of nitrate of soda, as is shown by the steep upward slope of the curve for N which rises from 1·16 tons of green matter per acre at the 0 level to 4·62 tons at the 1¼ cwt. level, and to 7·61 tons at the 2½ cwt. level (Plate 44). The degree of response to this fertilizer is almost directly proportional to the amount applied, the yield given at N_1 being approximately half way between those given by N_0 and N_2. This result suggests that the yield might have been still further increased by heavier applications of nitrate of soda, and points to a serious nitrogen deficiency in the orchard soil involved. The ability of rye to establish itself and to grow through the winter months was most marked, particularly in plots that had

Plate 44.

PLOT OF RYE.—Plot on left received 2½ cwt. nitrate of soda and yielded 7.7 tons green matter per acre; plot in foreground received 1 cwt. sulphate of potash and yielded 1.5 tons per acre.

received nitrogen; indeed, differences between plots receiving nitrogen and those from which nitrogen was omitted were very striking almost from the time the plants first appeared aboveground.

Plate 45.

ANOTHER PLOT OF RYE.—This rye plot received 1 cwt. each of superphosphate and sulphate of potash per acre; it yielded 1.4 tons per acre.

Superphosphate and sulphate of potash, applied singly or in combination, produced no significant growth response at any level of application, as is indicated in Plate 43 by the flatness of the P and K curves. Plots receiving these two fertilizers yielded about 1 ton of green matter per acre (Plate 45); this was comparable with the yield obtained in unfertilized plots. The relative effectiveness of the different fertilizers is emphasised in Plate 46.

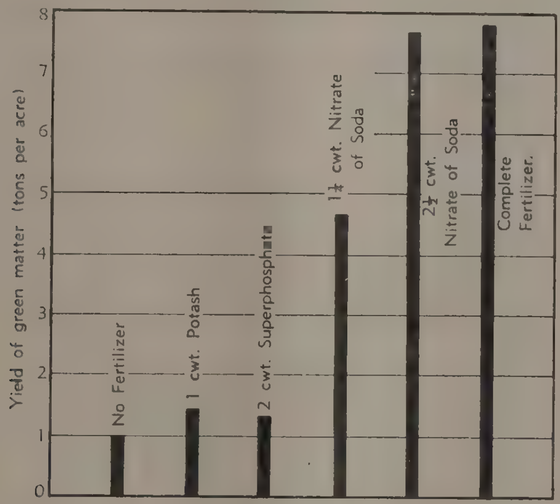


Plate 46.

FERTILIZER EXPERIMENT AT COTTONVALE, 1939.—Showing marked responses to applications of nitrate of soda on rye plots in a low-vigour, nineteen-year-old apple orchard at Cottonvale.

In the second experiment on rye, that at Glen Aplin, where the same treatments were applied, the results obtained were generally similar to those of the Cottonvale experiment. Here, again, the nitrogenous fertilizer, this time sulphate of ammonia, produced large and highly significant responses (Plate 47).

The first application of sulphate of ammonia, i.e., 1 cwt. per acre, increased the yield of green matter from 1·71 tons per acre to 4·24 tons, and the second application of 2 cwt. per acre increased it further to 5.85 tons. The increase from the second application was, however, significantly less than the increase from the first, and this would appear to indicate that 2 cwt. per acre is approaching the maximum desirable quantity. Superphosphate gave no significant response whatever, whilst sulphate of potash gave a significant though small increase with an application of 1 cwt. per acre. In this experiment potash tended to lead to increased yields at the highest level of sulphate of ammonia (Plate 47).

Responses on Pea Plots.

At Cottonvale, significant increases in yield followed the use of all fertilizers at one or other of the levels employed. The 1¼ cwt. per acre level of nitrate of soda gave a well-marked response by increasing the quantity of green matter from 1·96 to 3·06 tons per acre as shown in

Plate 48. The highest level of $2\frac{1}{2}$ cwt. per acre did not cause a significant increase in yield over that obtained at the lower level, although there was still an upward trend. Plots receiving potash at the rate of $\frac{1}{2}$ cwt. per acre yielded significantly more than either the no-potash plots or those receiving 1 cwt. per acre. In other words, $\frac{1}{2}$ cwt. of potash gave an increase in yield, but 1 cwt. of this fertilizer tended to depress it. With respect to superphosphate, at the level of 1 cwt. no increase in yield occurred; but the higher application of 2 cwt. per acre caused a well-marked rise from 2·15 to 3·93 tons of green matter per acre. These responses of P and K were noticeable in both the presence and the absence of nitrogen.

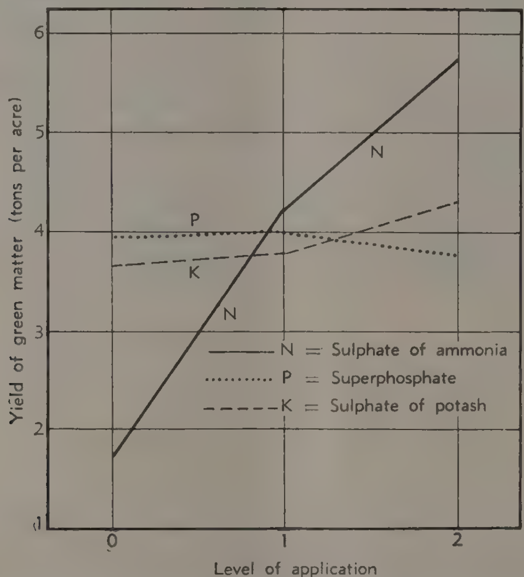


Plate 47.

FERTILIZER EXPERIMENT AT GLEN APLIN, 1939.—Showing interactions between sulphate of ammonia (N), superphosphate (P), and sulphate of potash (K) on rye plots.

A study of the interaction of nitrate of soda and superphosphate in these plots showed that the heaviest application of superphosphate was more beneficial when applied in conjunction with the highest level of nitrate of soda. In the interaction of sulphate of potash with superphosphate the depression of growth resulting from the higher level of potash was more marked at the higher level of superphosphate.

The results obtained at Glen Aplin (Plate 49) differed in some respects from those at Cottonvale. In the Glen Aplin plots sulphate of ammonia caused significant responses at both rates of application. This fertilizer applied at the rate of 1 cwt. per acre increased the yield from 0·76 tons to 1·35 tons, whilst 2 cwt. increased it to 2·35 tons. An application of 1 cwt. of superphosphate led to a small increase in yield from 1·21 to 1·76 tons per acre, but 2 cwt. did not give any further increase. Potash gave no significant responses in the experiment. The relatively low yield of green matter in even the best of the pea plots is noteworthy, indicating as it does the difficulty experienced with field peas in producing that bulkiness of crop which is so desirable.

1940 Experiment.

In the 1940 experiment, which was laid down in April, all possible combinations of nitrate of soda, superphosphate, and sulphate of potash at three levels were applied in a factorial layout in which lupin plants were sown. Unfortunately, the experiment was marred by an

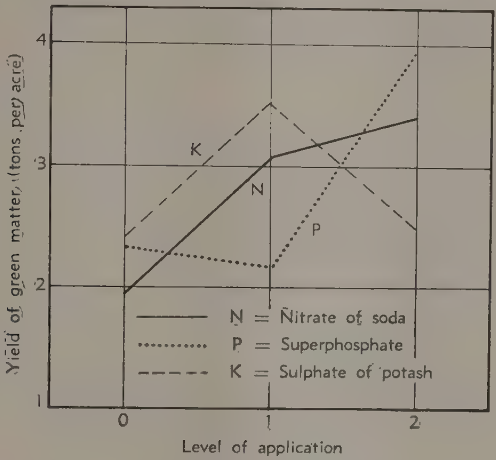


Plate 48.

FERTILIZER EXPERIMENT ON FIELD PEAS AT COTTONVALE, 1939.—Showing interactions between nitrate of soda (N), superphosphate (P), and sulphate of potash (K).

unusually poor germination of seed which ranged from 10 per cent. to 20 per cent. in the field. In these circumstances no quantitative results could be secured, but a most marked improvement in growth was obtained in plots receiving mixtures of fertilizers containing nitrogen. In these plots the plants made healthy growth under conditions imposed by severe frosts occurring sometimes below 10 deg. Fahr., and by winter drought which resulted from a fall of only 2·15 inches of rain during the five-month growing period of the plants. Frost injury in fertilized plots, all of which received nitrate of soda, could not be regarded as having been severe, and the plants reached a height of 12 inches. In

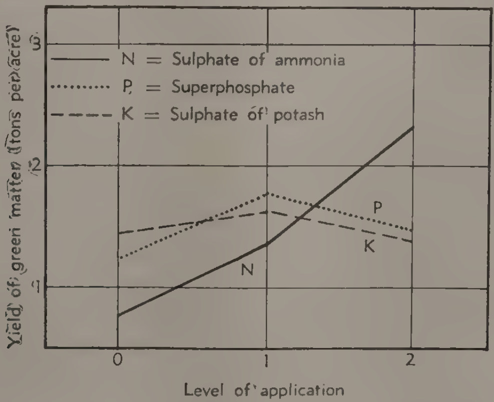


Plate 49.

FERTILIZER EXPERIMENT ON FIELD PEAS AT GLEN APLIN, 1939.—Showing interactions between sulphate of ammonia (N), superphosphate (P), and sulphate of potash (K).

unfertilized plots more than half the plants died, and those surviving were severely stunted, attaining a height of only 3 or 4 inches. It appeared from this result that the fertilizers were effective in increasing the resistance of the plants to frost and drought injury. Laboratory germination tests showed that 77 per cent. of the seed used in this experiment was viable. The cause of the particularly low germination in the field is under investigation.

Discussion on Fertilizer Experiments.

In all the experiments described above, nitrogenous fertilizers have given outstanding results. Cereal crops have responded very strikingly and consistently to applications of nitrate of soda and sulphate of ammonia, irrespective of whether they were applied alone or in combination with superphosphate or sulphate of potash, or with both these fertilizers. Average increases in the yield of green matter have been sixfold in old orchards of low vigour, and twofold in young orchards in which soil fertility was still comparatively high. Fertilizers containing phosphoric acid and potash have caused no marked response in any of the experiments on cereals, and in view of the healthy growth of plants in plots receiving nitrogen only, it appears that they received adequate supplies of phosphoric acid and potash from the soil. This does not prove, however, that the supplies of these elements are adequate for all crops which might be planted, nor even for a succession of green manure crops.

Responses by leguminous crops, whilst not as spectacular as those by cereals, have been none the less definite. With legumes, nitrogenous fertilizers again played a prominent part, and produced the greatest increases in yields of lupins and field peas, while superphosphate has caused small but significant increases on several occasions. The best results tended to be given by a mixture containing a nitrogenous fertilizer and superphosphate. Potash was responsible for a slightly increased yield in only one of the four experiments in which it was used on legumes.

The effect of nitrogenous fertilizers on the type of plant produced has been most striking, especially where cereal varieties are concerned. Cereals receiving treatments involving the application of superphosphate in the absence of nitrogen, whether or not potash was present, have invariably developed into spindly, stunted plants with only two to five tillers and sparse flag formation (Plate 50).

The colour of these plants was always pale-green to yellowish, a condition usually indicative of nitrogen starvation. Unfortunately, cereal crops consisting almost entirely of plants of this type are far too common in Stanthorpe orchards and vineyards. The growing of such crops as these plainly represents wastage in labour and materials. Where a nitrogenous fertilizer was applied at the time of sowing a cereal crop, a beneficial effect on growth was noticeable very soon after germination, and this effect became more and more marked as growth continued. The plants were very different from those described above, their colour now being a healthy deep-green, their rate of growth increased, and, most important, tillering and flag production multiplied many times, 12 to 30 tillers being produced per plant (Plate 50).

In legumes, nitrogen deficiency is most marked in the early stages of growth. Peas and lupins show this deficiency in the first few weeks after germination by the slow and stunted growth of the plants, and by

a red or crimson colouration of the foliage, especially in leaves near the base of the stem. As the plants grow older, newly-formed leaves may be a normal green colour, if root nodule bacteria have become active and are supplying the plant with nitrogen fixed from the atmosphere. In many experimental plots the plants did not reach this second stage, but remained stunted, unhealthy in colour, and often died. This would seem to indicate that in these cases not only was the soil very deficient in nitrogen, but also that the appropriate strains of nitrogen-fixing bacteria were absent.

Plate 50.

Influence of Nitrogen on Growth of Rye Plants.—Plants on left typical of those from no-nitrogen plots. Plant on right from plot receiving 2 cwt. nitrate of soda per acre.

GREEN MANURE CROP VARIETAL EXPERIMENTS.

In experiments with green manure crops, the varieties were sown in randomised blocks each of which was replicated four times. In the first two years the plots were fertilized with 1½ cwt. of sulphate of ammonia, 1½ cwt. of superphosphate, and ¾ cwt. of sulphate of potash per acre, but subsequently potash was omitted. Methods of sowing and sampling the plots were the same as in the fertilizer experiments, and the usual observations on growth habits, reactions to climate, &c., were made.

1937 Experiment.

The varieties tested in 1937 were Dun field peas, tick beans, New Zealand blue lupins, subterranean clover, Florence wheat, and Cape barley. The experiment was so designed that a comparison could also be

made between legumes inoculated with the correct strains of nodule bacteria and those not inoculated.* Very little rain fell in the four months following the sowing of the crops, and this resulted in the failure of most varieties, so that no quantitative data were obtained. At the ploughing-in stage the growth made by the lupins was notably better than that of any other crop (Plate 51). The other legumes and the two cereals made very poor growth, but the clover plants were healthy and would probably have made good growth during the spring.

1938 Experiment.

The above experiment was repeated in 1938 on the same site at The Summit as was used in 1937, but with the addition of three other varieties, viz., rye, Golden tares, and red clover. The original varieties were sown in the same plots as they had occupied in the previous year, so that observations could be made in connection with the nitrogen-fixing organisms. The additional legumes were not inoculated.

During their growing period, the crops received sufficient rain to preclude the possibility of soil dryness being a factor limiting their growth, but the usual frosty conditions prevailed throughout. Under these generally favourable growing conditions the growth made by the different varieties was strongly contrasted (Plate 52). Since the clovers made very little growth they were not sampled and do not therefore appear in the table of results.

TABLE 3.

SHOWING RATE OF YIELD OF GREEN MATTER BY GREEN MANURE CROP VARIETIES. SEEDING RATE 80 LB. PER ACRE FOR EACH VARIETY. THE SUMMIT, 1938.

Variety.	Yield of Green Matter in Tons per Acre.	Variety.	Yield of Green Matter in Tons per Acre.
1. Dun field peas (*a*)*	1·51	6. Lupins (*b*)	10·50
2. Dun field peas (*b*)*	2·45	7. Golden tares ..	7·42
3. Tick beans (*a*) ..	3·24	8. Wheat	2·21
4. Tick beans (*b*) ..	4·41	9. Rye	2·59
5. Lupins (*a*)	10·72	10. Barley	1·52

Standard error .. .. .. ·321

Significant difference .. .. ·94

* (*a*) Soil inoculated with appropriate strain of root nodule bacteria ; (*b*) soil not inoculated.

In Table 3 the final results are expressed in terms of tons of green matter produced per acre. Field peas and tick beans made relatively poor growth when compared with lupins and Golden tares. A high proportion of the field pea plants was partly or wholly dried up, owing to their inability to withstand the severe frosts, whilst tick beans, although not showing frost injury, were rather stunted and produced an inadequate quantity of green matter. Nevertheless, this latter crop yielded significantly more than wheat and barley or peas on inoculated soil. Although the field peas and tick beans gave better results in 1938 than in the previous year, they did not make satisfactory growth in this experiment. However, apart from the experimental plots, field peas made relatively good growth in 1938 in a number of orchards where frosty conditions were less severe.

* Bacterial cultures for this and other experiments were supplied by the Waite Agricultural Research Institute, South Australia.

From Table 3 it is obvious that lupins and Golden tares made vigorous and extensive growth despite numerous frosts, and gave yields which amounted to more than 10 and 7 tons per acre respectively, and were thus outstanding as compared with any other varieties. From the figures it seems that these two crops can make sufficient growth between mid-autumn and early spring to produce a bulky crop of green matter provided they receive adequate fertilizer applications. The main grow-

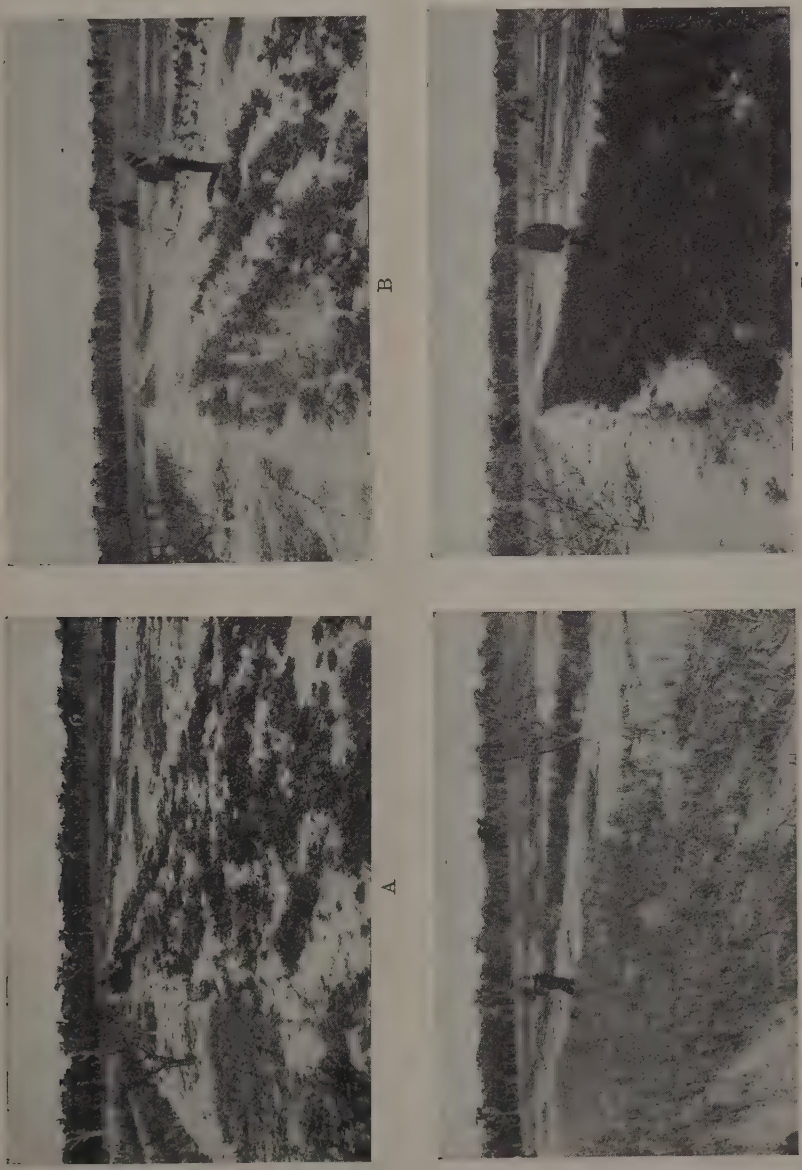


Plate 51.

Contrasts in Growth made by Various Green Manure Crops under Dry Winter Conditions, 1937.—(A), Dun field peas; (B), tick beans; (C), Florence wheat; (D), New Zealand blue lupins.

ing period of the lupins, i.e., between germination and the commencement of flowering, amounted to 142 days, while that of Golden tares was about 165 days.

All of the cereal crops in the test made unsatisfactory growth, but significant differences were revealed. Barley, wheat, and rye were inferior to tick beans, Golden tares, and lupins, but rye gave better results than barley and field peas. The cereal plants were generally characterised by spindliness, poor flag growth, paucity of tillers, and paleness of foliage; while the barley was extensively attacked by rust disease. These conditions suggest deficiencies in soil nutrients, but since the plots received an application of $3\frac{3}{4}$ cwt. per acre of a mixture of sulphate of ammonia, superphosphate, and sulphate of potash (2:2:1), it would seem that the growth of the plants was limited by soil deficiencies other than of these particular elements. In other words, the soil requirements in this orchard were apparently not satisfied by supplying N, P, and K only. It is noteworthy that rye grown in a fertilizer experiment in another orchard during the same season made excellent growth, as can be seen from the results of the 1938 fertilizer experiment and from Plate 42. The growing periods of the cereals were—wheat 114 days, rye 125 days, and barley 120 days.

Plate 52.

GENERAL VIEW OF GREEN MANURE CROP VARIETAL EXPERIMENT, 1938.—**Note strong contrasts between plots containing different varieties.**

That legumes grown in plots which had been inoculated in the previous year did not differ significantly from those grown in uninoculated soil is not explicable from the information so far available. Root examinations revealed that the amount and type of nodulation on any one variety were somewhat similar, irrespective of whether or not the variety was grown in inoculated soil. In a legume experiment carried out in the winter of 1938 no significant differences in yield were shown between inoculated and uninoculated plants. These results suggest that

in this instance the growth of the legumes was limited by factors other than the presence or absence of suitable strains of bacteria, but it is not considered that this should be construed as meaning that these organisms are of little importance.

1939 Experiment.

The results obtained in the 1939 experiment, which included Golden tares, Purple vetch, tick beans, Grey field peas, Dun field peas, and rye, are shown in Table 4 in which low-yielding and high-yielding varieties are separated into two groups. In the former group, Purple vetch yielded less than any other variety, and the remaining two varieties gave comparable amounts of green matter. The yield given by Golden tares sown at the rate of 90 lb. per acre was equivalent to that obtained at 60 lb. per acre. Further, the combination of tick beans with Golden tares did not lead to any increase in the amount of the crop. The yield of some of the varieties in this experiment was influenced by the late sowing of the crops.

TABLE 4.

SHOWING RATE OF YIELD OF GREEN MATTER BY GREEN MANURE CROP VARIETIES. THULIMBAH, 1939.

Variety.	Rate of Seeding per Acre.	Yield of Green Matter in Tons per Acre.
1. Golden tares	90 lb.	2·5
2. Golden tares	60 lb.	2·7
3. Purple vetch	20 lb.	1·8
4. Tick beans and Golden tares	45 lb. each	3·2 (0·9 beans + 2·3 tares)
Significant difference 0·75 for varieties 1 to 4.		
5. Rye	90 lb.	4·3
6. Grey field peas	90 lb.	3·9
7. Grey field peas	60 lb.	3·6
8. Dun field peas	60 lb.	4·2
9. Grey field peas and rye	45 lb. each	4·2 (0·3 peas + 3·9 rye)
10. Golden tares and rye	45 lb. each	4·6 (0·3 tares + 4·3 rye)
11. Grey field peas and Golden tares ..	45 lb. each	4·0 (2·2 peas + 1·8 tares)
Significant difference 1·05 for varieties 5 to 11.		

In the second group all varieties and combinations must be considered as having given comparable results, since none of the differences in yield is significant. Grey field peas yielded the same amount of green matter when sown at the rate of 60 lb. per acre as when sown at the rate of 90 lb. per acre.

No increase in yields resulted when varieties were combined together in pairs, each at a reduced rate of seeding. In three of the four combinations one of the varieties was markedly predominant over the others. This was particularly evident in the rye-field peas and rye-Golden tares combinations in which rye formed 93 per cent. and 94 per cent. respectively of the total yields. The domination of rye was due to its growth being more rapid in winter than that of the other varieties. Observations on these plots suggest that the combinations would have been more effective if the relative seeding rates had been altered so that the amount of rye seed sown was considerably less than that of the legumes. In the field pea-Golden tares combination each produced much the same quantity of green matter, the total being made up of 55 per cent. field peas and

45 per cent. Golden tares. It is noteworthy that rye when sown at 90 lb. per acre yielded essentially the same quantity of green matter as when sown at 45 lb. per acre in combination with golden tares. This indicates that, within limits, heavier sowing of seed does not lead to increased quantities of green matter.

1940 Experiment.

Crops grown in the 1940 experiment were New Zealand blue lupins, Golden tares, Dun field peas, fenugreek, rye, and Sunrise oats. Just prior to sowing in early April the plots received 2 inches of rain, but in the ensuing five months only 2·15 inches of rain fell, little of which was effective. During this period of drought the plants were subjected to numerous and severe frosts, some of which occurred at grass temperatures in the vicinity of 10 deg. Fahr. Under these conditions the crops did not make much growth, but useful information was obtained on the drought and cold resisting qualities of the plants. Notes on the performance of the 1940 crops are included in the following discussion on varieties.

GENERAL NOTES ON VARIETIES.

The ability of the **New Zealand blue lupin** (Plate 53) to resist the droughty and frosty conditions which often occur in winter at Stanthorpe at once marks it as a desirable type of green manure plant for this district. Frost injury had not occurred in any of the lupin plots until the severe winter of 1940. At this time a few plants were killed and others bore an injury on the main stem near ground level. This damage did

Plate 53.
THREE PLANTS OF NEW ZEALAND BLUE LUPINS GROWN DURING AUTUMN AND WINTER, 1939.

not appear to interfere with the growth of the plants which generally remained healthy, though, of course, somewhat stunted by the drought conditions. Observations show that the degree of susceptibility of lupins to frost injury is considerably influenced by the vigour of the plants and that this susceptibility is increased particularly at the stages immediately after germination and just prior to flowering. Of the legumes under investigation this year, lupins were the least affected by frost, and further, the only effective leguminous crops observed in the district in 1940 consisted of lupins alone or in combination with Golden tares. The varietal experiments must be considered to have demonstrated that the lupin plant is well suited to local climatic and soil conditions, and it may be noted that this is in conformity with experience on similar soils in other parts of the world.

Plate 54.
New Zealand Blue Lupin Crop Grown in 1938 Varietal Experiment.—Some plots yielded 16 tons of green matter per acre.

In the various experiments lupins have yielded much more heavily than other legumes (Plate 54), and when compared with cereals have more than equalled an exceptionally good crop of rye. In some instances, however, lupins, in common with other legumes, do not give a really satisfactory yield of green matter in the first year of planting, but such an occurrence does not condemn the plant as being unsuitable. Improvements in growth in the second and subsequent years can be expected with the development of the correct strains of bacteria in the soil. The successful establishment of any leguminous crop under Stanthorpe conditions may require not only the use of fertilizers, but also the artificial inoculation of the seed with appropriate strains of bacteria.

Lupins do not make extensive winter growth, and it therefore appears to be necessary to sow the crop in time for it to receive the full benefit of autumn rains, and so that the plants will be well established before the winter. They make rapid growth in early spring. The lupin

plant contains an alkaloid which is present most abundantly at the stage of seed formation, and this alkaloid may be toxic to farm animals if sufficient of the plant be consumed.

Golden tares are capable of producing a heavy crop of green matter and seem to be well suited to local climatic and soil conditions (Plate 55). Although very resistant to cold, this variety may be damaged to a small extent by severe frosts, and in this respect is a little more susceptible than lupins. It withstands drought conditions very well. Its growing period is about three to four weeks longer than that of lupins, and for satisfactory growth it should be sown early in autumn. It breaks down rapidly after being turned under.

Plate 55.
GOLDEN TARES YIELDING 7 TONS GREEN MATTER PER ACRE, 1938.

Dun field peas have been used in the trials more than any other variety of field peas, and it is rather significant that the best yield given by this variety during the four years was 4.2 tons per acre. This cannot be considered a satisfactory quantity of green matter. Though the variety may be resistant to frosts of moderate intensity, it is often seriously injured or killed outright by severe frosts (Plate 56); in 1940 most of the field pea plots were completely destroyed by frosts. Grey or Partridge field peas were used only in 1939, when their yield was similar to that of the Dun variety. Their performance under intense frosts has not yet been determined in experiments. Although

Dun field peas are probably used more commonly in the district for green manuring than any other legume, their performance in comparative experiments does not suggest that they possess any particular merit to justify that popularity.

Tick beans make little growth in winter, but provided sufficient moisture is available, they can survive the cold and will make fairly good growth in autumn and spring. Although they appear to be more resistant to frost injury than Dun field peas, they seem to be very adversely affected by dry winter conditions, and for this reason they show little promise of being successfully employed as a regular winter green manure crop in the Stanthorpe district.

Plate 56.
DUN FIELD PEAS YIELDING 1·8 TONS PER ACRE, DAMAGED BY FROST, 1939.

Purple vetch is somewhat slow growing and under Stanthorpe conditions seems to be quite unable to yield a bulky crop of green matter. For optimum growth the plant apparently requires more winter rain than usually falls in this district. It may be noted that common vetch grows along orchard headlands and in other situations in a wet winter, but is not in evidence under dry conditions.

The experiments have shown that subterranean clover (*Trifolium subterraneum*), red clover (*T. pratense*), and Bokhara clover (*Melilotus alba*) are not suitable for winter green manure crops at Stanthorpe. When sown in mid- to late autumn germination is very slow, and growth made during the winter is negligible. These plants can withstand a considerable amount of drying out of the soil and are resistant to frost injury. Under favourable spring conditions they grow rapidly, and although they are not suitable as winter crops, it is considered possible that a method of using clovers sown in late winter to improve the humus and nitrogen content of the soil may yet be found.

Black Winter rye has several characteristics which make it superior in many respects to the various other cereals tested. This variety is highly resistant to frost and shows no sign of injury even when minimum grass temperatures fall as low as 10 deg. Fahr., except when in the flowering stage; the frosts in 1940 left the experimental crop unharmed. The plant is able to make a moderate amount of growth under very dry conditions, due no doubt to its extensive root system. It tends to run to stalk rather rapidly and should, therefore, be ploughed in at an early stage. If its moderate moisture requirements be satisfied the plant will continue to grow throughout the winter, and with a rapid increase of growth in early spring it will finally produce a large amount of green matter. The ability of the plant to withstand acid soil conditions and to make good growth in sandy soils is well marked. It is reported to make normal growth in soils which give rise to copper deficiency disorders in other plants (Riceman and Donald, 1939).* For these reasons rye is regarded as a very suitable cereal for green manurial purposes in the Stanthorpe district.

Wheat has not been used extensively in the experiments, but the available experimental and observational evidence suggests that, with suitable fertilizing and sufficient moisture, Florence wheat makes satisfactory growth as a winter crop, and is resistant to normal frosts. Wheat is, generally speaking, less tolerant to soil acidity than rye.

Barley has not given impressive results in field tests. It often shows unhealthy foliage colouration and lack of vigour under Stanthorpe winter conditions, and it seems to be more subject to disease, notably rust, than the other cereals tested. It is liable to injury by severe frosts. Barley is not very tolerant of acidity, and on this account local soils may impose a restriction on its growth.

Limited tests have shown that **Sunrise oats** may provide a good crop of green manure during winters in which abnormally severe frosts do not occur. Frosts developing at grass temperatures of about 15 deg. Fahr. and lower cause serious yellowing and subsequent death of much of the foliage, whereas under similar conditions rye is unaffected. Oats is recognised as a plant which tolerates soil acidity, and in this respect it compares favourably with rye and is to be preferred to barley.

GENERAL RECOMMENDATIONS.

The supplying of organic matter to Stanthorpe soils is of fundamental importance to the maintenance and improvement of soil fertility in the district and, therefore, it is recommended that green manuring be adopted as a routine practice in orchards, vineyards, and vegetable gardens. In this branch of farm work growers are urged to employ improved methods, for the sowing of untried varieties on unprepared and unfertilized land is certain to lead to the failure of the crop.

New Zealand blue lupins and Golden tares are legumes of outstanding merit for the Stanthorpe district. Lupins should be the first choice as they are quick-growing and best able to survive both frost and drought conditions, and in general they form an excellent type of green manure plant. A legume should not be judged on the growth made in the first

* Copper response on "Coasty" Calcareous Soils in South Australia. Riceman, D. S., and Donald C. M., Journal of Department of Agriculture, South Australia, Volume XLII., No. 11, 1939.

year of planting as two or three successive crops may be required before the variety reaches its maximum growth.

Black Winter rye is outstanding for its winter hardiness and drought-resisting qualities, and will generally make good growth as a winter crop. Sunrise oats and Florence wheat are in some respects also suitable varieties, but they are sometimes damaged by severe frosts. Cape barley is less satisfactory than the other cereals mentioned.

Seed should be sown in land which has been properly prepared by suitable cultivation. In the absence of a seed drill the seed should be buried, after broadcasting, preferably by means of a plough, rotary hoe, or cultivator, but harrows are fairly effective with most seeds. The recommended rates of seeding per acre are—(*a*) New Zealand blue lupins or Golden tares, 1 bushel for first one or two years, thereafter ¾ bushel; (*b*) Black Winter rye, Sunrise oats, or Florence wheat, 1 bushel.

The time of sowing is governed largely by autumn rainfall. Cultural preparations for the sowing of the crop should be made in March so that both soil and crop will benefit from any useful autumn rains. Early sowing is always preferable to late, as the plants should be well established before the approach of winter. Rye can be sown later than any of the other crops mentioned above.

Fertilizers should be broadcast and ploughed in in the course of the preparation of the seed-bed, and they can be applied advantageously one or two weeks before the seed is sown. Experience has shown that, although satisfactory results usually follow the simultaneous application of seed and fertilizer, fertilizers in close proximity to the seed may lower germination. The following rates of application per acre are recommended—(*a*) For legumes, 1½ cwt. sulphate of ammonia or 1¾ cwt. nitrate of soda together with 1 cwt. superphosphate in both cases; (*b*) for cereals, 1½ cwt. sulphate of ammonia or 1¾ cwt. nitrate of soda. Lower rates of application for both legumes and cereals can be used if the soil has recently received adequate nitrogenous fertilizers.

Unless the crop is turned under in good time the ratio of carbon to nitrogen in the plants becomes so wide, that is, the carbon content becomes large and the nitrogen content comparatively small that one of the important objects of green manuring, namely, increasing the amount of available nitrogen in spring, may be defeated. In cereals particularly the carbon-nitrogen ratio widens rapidly as the plants approach maturity, so that if a winter-grown crop is ploughed in after the seed-heads have begun to form, the amount of available nitrogen in the soil may temporarily be reduced at a time when the fruit trees particularly require that element. Such action is brought about by those soil bacteria which are largely responsible for decomposing the green manure crop, for they are forced to draw on the soil nitrogen for their energy requirements if they are unable to obtain it from the green manure crop itself. It is advisable, therefore, that green manure be turned under before the crop reaches the flowering stage and in time to allow of the decomposition of the plants, and the resultant liberation of nitrogen so that that element will be available when the trees require it in early spring. Young plants decompose more rapidly than mature ones, and legumes more rapidly than cereals and most other non-leguminous plants. As a general rule, non-leguminous crops (Plate 57) should be ploughed in six or seven weeks and legumes three or four weeks before the end of the dormant period of the crop plants they are intended to benefit.

SUMMARY.

The practice of green manuring is rendered difficult in the Stanthorpe fruitgrowing area by climatic and soil conditions. Limiting features of the climate are severe winter frosts and uncertain rainfall which frequently results in low soil moisture; whilst direct soil factors include unavailability of certain plant food elements and, to a less extent, soil acidity. Green manuring practices in local orchards and vineyards vary greatly, and adequate crops of green manure are not commonly produced.

Investigations were begun in 1937, firstly, to determine the fertilizer requirements of leguminous and cereal crops grown as winter green manure, and, secondly, to test potentially suitable green crop varieties. The results of four years' experimentation are reported.

Plate 57.

EFFECTIVE PLOUGHING-IN OF THE GREEN MANURE CROP ENSURES ITS RAPID DECAY.—Cereal crops should be turned under at least six weeks prior to the blossoming of the trees it is intended to benefit.

The fertilizer experiments with the legumes, lupins and field peas, have shown (1) that the yield of green matter is increased more by sulphate of ammonia and nitrate of soda than by superphosphate or sulphate of potash or any combination of the latter two; (2) that certain combinations of superphosphate and potash gave small but significant responses on peas, particularly when a nitrogenous fertilizer was included in the mixture. The results generally suggested that restrictions may be imposed on the growth of legumes not only by a shortage of nutritional elements, but also by other factors not yet fully determined.

Fertilizer experiments with cereals showed that nitrogenous fertilizers greatly improved the type of plant, and consistently caused striking increases in the quantity of green matter even in seasons of low rainfall. Phosphatic and potassic fertilizers gave no marked responses.

Various species of leguminous and cereal plants have been tested as winter green manure crops. New Zealand blue lupins and Golden tares are outstanding among the legumes for their ability to grow effectively despite severe frosts and periods of low rainfall. Dun field peas, commonly used in the district for green crops, are susceptible to injury from severe frosts, and seldom yield satisfactory amounts of green matter.

Of the cereals tested Black Winter rye proved the most outstanding in frost and drought resisting qualities. Sunrise oats showed that it could make extensive growth under normal winter conditions, but could not resist injury from the more severe frosts. Cape barley was the least satisfactory of the cereals.

General recommendations, based on experimental results and extensive observations, are given for green manuring in the Stanthorpe district.

MILLETS FOR FODDER PURPOSES.

The quickest growing fodder crops are the millets. Since the preparation of the land for winter cereals will probably be shallower than that necessary for maize and sorghums, millets should give the most profitable returns.

The millets—Japanese, white panicum, and giant setaria or giant panicum—are hardy plants and stand dry conditions well. They are quick growing and have supplied material for grazing within six weeks of planting. These plants, however, should not be grazed before the roots are sufficiently strong to avoid their being pulled up by stock; and where judiciously grazed under favourable weather conditions, a good ratoon crop can be expected of them.

Where the green feed is not needed millets make a good quality hay, if cut when the seed heads are formed and before the seed has developed. A delay in cutting occasions loss in several different ways, and it is better, if there is any doubt as to when the crop is to be cut, to err on the side of greenness rather than otherwise. If cut too green, the hay may cause a slight scouring of stock; but if it is too well matured a loss of digestible plant nutrients will result. Further, if such a free seeding crop is allowed to mature, the scattered grain will cause trouble in subsequent crops by the resultant volunteer growth, and the seed, if carried into the haystack or shed, provides food for mice.

With a desire to attain balance in their stock foods, farmers have successfully made light sowings of cowpeas with the millets for grazing purposes, thus increasing the protein content of their fodder and so improving their cream returns.

Millets also, especially in combination with coarse-stalked crops—such as maize and sorghum—make excellent silage; and since they produce 10 to 12 tons of green material to the acre under good conditions, they may be used most advantageously for that purpose.

Millets prefer a loam for maximum growth, but will grow on a wide range of soils; even poor lands if sufficient moisture is present will give payable yields. Early sowings can be made as soon as frosts are over and can be continued successfully until January and February. Only small areas should be planted in November and December to provide grazing, as the heavy summer rains in January are apt to prevent the harvesting of any surplus as hay.

For sowing 10 to 12 lb. of seed per acre are usually sufficient when broadcast and harrowed in. When sown for hay, or on rich soils, a heavier seeding (about 15 lb.) is frequently used with a view to producing a fine-stemmed crop. Too heavy a seeding (over 20 lb.), however, will not have this effect, since—especially during a short dry spell—the original stand is quickly reduced by competition sometimes even to meagre proportions.

Of the varieties white panicum is undoubtedly the most popular. A quick grower, it stools well and reaches a height of from 4 to 6 feet. It has a flat stem and makes a good bright hay of some commercial value. Japanese millet is slightly shorter in its mature growth, but is—especially in the earlier stages—an even quicker grower and heavier stooler than white panicum, and is most suitable for grazing. Giant setaria (or giant panicum) has also received some attention, and under favourable conditions good results are obtained. Under adverse conditions, however, it does not appear to give as good results as the other varieties.

The millets also are very useful in controlling summer weed growth, but, of course, should be taken out before the time arrives to begin preparing the land for autumn planting.

Poultry Farming in Queensland.

(*Continued from page* 116, *August*, 1941.)

THE STRUCTURE OF THE FOWL.

SKELETON.

Birds are vertebrates which are especially adapted for flying or running. Thus the forelimbs (the wings) and the hindlimbs (the legs) are not used simultaneously in progression, as occurs in most animals. The skeleton, as the framework upon which the muscles work, is specially modified to this end. In the flying birds there is great development of the forelimbs and attached muscles. In poultry, where the power of flight is largely lost, the forelimbs are comparatively weak and the hindlimbs relatively stronger.

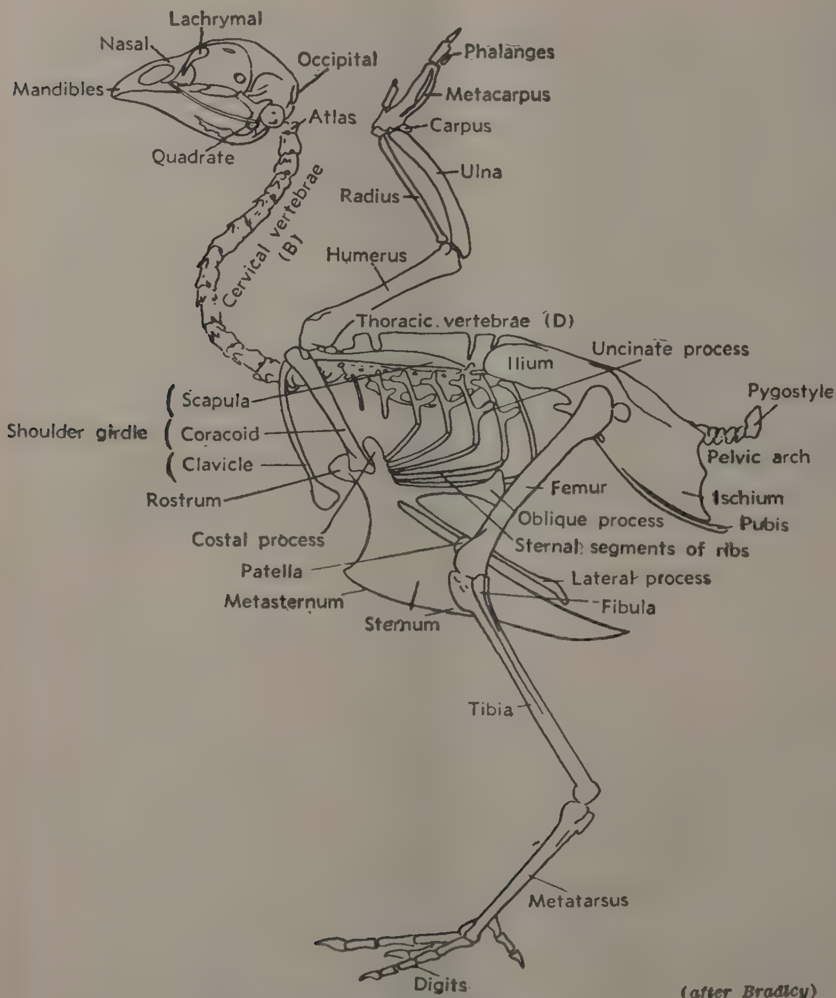


Plate 38.

THE SKELETON OF THE FOWL.

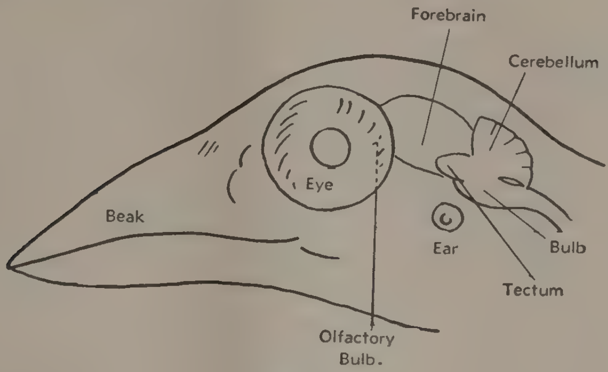


Plate 59.
THE SKULL AND BRAIN, SIDE VIEW.

In all poultry the skeleton is modified from that of other vertebrates in that—

1. The shoulder girdle consisting of the coracoid, clavicles and shoulder blade has been stiffened to make a firm fulcrum upon which the bases of the wing rest.
2. A keel for the attachment of large pectoral muscles has been developed along the sternum.
3. The bones are strong and light and contain air spaces which communicate with air sacs. These sacs are distributed in the dorsal part of the body, thus keeping the centre of gravity low, and contributing towards stability in flight.
4. The pelvic girdle (hip bone), composed of the ilium, ischum, and pubis, is incomplete ventrally to permit of the passage of the large size eggs through the genital passages.
5. And finally the vertebrae of the lumbo-sacral region are fused with the hip bones for increased rigidity. The air sacs not only contribute to stability, but also have a respiratory function. In the rumpless fowl the pygostyle and some of the coccygeal vertebrae are missing.

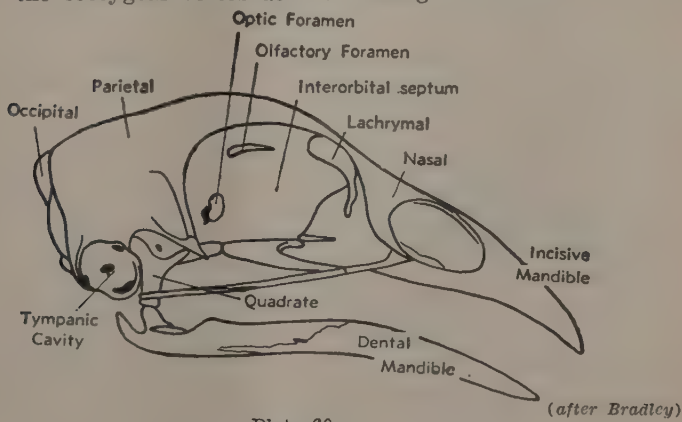


Plate 60.
THE SKULL.

The **Skull** consists of the following component parts:—

The *Lachyrmal Bone* forms part of the margin of each eye cavity.

The *Occipital Bone* forms the base of the skull and originally consists of four parts.

The *Quadrate Bone* is the bone between the lower jaw and the cranium (upper part of the skull), which permits of the mechanical movement of the mandibles.

The *Parietal Bones* are the pair of broad, short bones between the occipital and frontal bones.

The *Frontal Bones* are the large bones which can be divided into the frontal, nasal, and orbital parts.

The *Nasal Bone* is a thin plate notched at the opening of the nasal cavity; is one of the facial bones.

The *Optic Foramen* is the opening in the bone, through which the optic nerve (nerve to the eye) reaches the brain.

The *Olfactory Foramen* is a channel in the bones through which the nerve governing the sense of smell connects with the brain.

The *Tymphanic Cavity* is the cavity of the ear.

The *Interorbital Septum* is the inner partition between the orbital cavities.

Plate 59 indicates the situation within the skull, of the ear, eye, and brain.

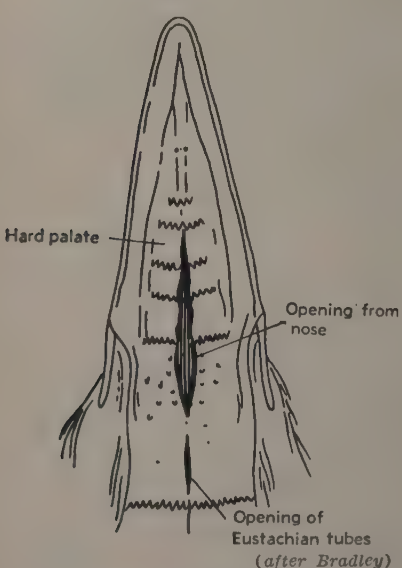


Plate 61.
ROOF OF THE MOUTH.

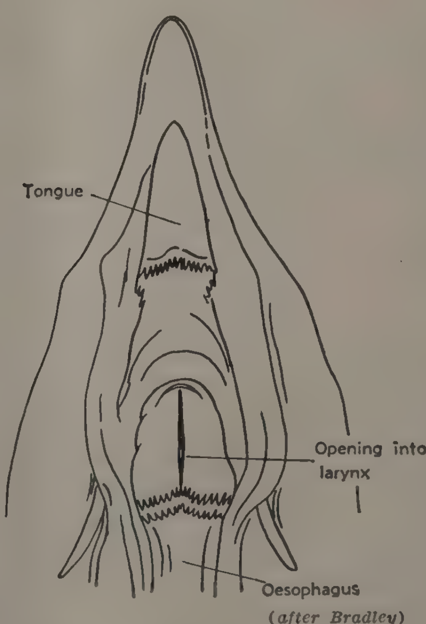


Plate 62.
FLOOR OF THE MOUTH.

The **Vertebral Column** is made up of the—

Cervical Vertebrae, consisting of the thirteen neck bones, of which the first is the *Atlas,* on which the skull rests. The atlas possesses a deep concavity which allows for the free movement of the skull.

Thoracic Vertebrae, seven in number, which carry the ribs. The second, third, fourth, and fifth bones of this section are fused together. The first two ribs are free, the others being attached by sternal segments (see Plate 58) to the sides of the sternum. The spread of the ribs has a direct relationship to the capacity of the lungs, heart, and liver.

Lumbar and Sacral Vertebrae, about fourteen in number, but merged into one bony mass.

Coccygeal Region, consisting of five or six bones, terminating in the pygostyle, the foundation of the tail.

The **Sternum** (breast bone).—This bone, in young birds, is most cartilaginous at the rear end. A serious fault is crookedness, which may be influenced by breeding, feeding, and perching. This bone articulates with the coracoid bone, and allows for the expansion of the abdomen when the bird is in production. The length of this bone is of considerable importance, as a long breast bone gives added support to the bird's abdomen and relieves the strain on the abdominal muscles. It is frequently found that the abdomens of birds with short breast bones sag, due to a rupture of the abdominal muscles.

The **Pelvic Arch**.—This consists of the ilium, ischium, and pubis. The *Ilium* is the largest of the section and is fused with that part of the vertebral column which contains the last thoracic, the lumbar, and sacral vertebrae. The inner surface provides the deep cavity in which the kidneys are lodged. The *Ischium* is much smaller than the *ilium.* The *Pubis* is the thin, narrow strip of bone running along the border of the *ischium,* being free at the lateral end. In young stock this lateral section is very easily injured in handling.

The pubic bones, when a bird is in production, are wide apart, but when not in lay they come much closer together at the free end. The distance between the tip of the sternum and the pelvic girdle is considered to some extent a measure of egg-laying capacity.

THE SKIN AND FEATHERS.

The skin is thin and contains no sweat glands, but over the base of the tail is a single oil gland, whose secretion the fowl uses when preening its feathers. The skin is divided into ten areas which grow feathers, called feather tracts or *pterylae.* The remaining spaces are devoid of feathers and are called *apteria.*

The feather tracts are situated as follows:—

1. Shoulder (humeral tract).
2. Thigh (femoral tract).
3. Rump (caudal tract).
4. Breast (pectoral or lateral tract).
5. Neck (cervical or anterior spinal tract).

6. Abdomen (ventral or inferior tract).
7. Leg (crural tract).
8. Back (dorsal or posterior spinal tract).
9. Wing coverts (alar tract).
10. Head (caput or head tract).

The colour of the skin varies from white to yellow, the latter being due to the presence of a fat pigment (lipochrome). The silkie appears to have a dark skin, but this is in reality due to the dark colour of the underlying tissues. In white-skinned breeds the bottoms of the feet are white and in yellow-skinned breeds yellow. Numerous nerve endings in it make the skin very sensitive, but the blood supply to it is small.

On the head the skin develops into special forms, e.g., the comb and wattles and ear lobes. The scales on the legs and feet, the toenails, and the horny covering of the spur are also derived from the skin.

Heat Regulation.—The body temperature of the fowl is higher than that of other animals, and more variable, with a daily range of from 105 deg. F. to 109·4 deg. F. The skin and feathers prevent undue heat loss. The skin itself, with its subcutaneous fat, acts as a sort of blanket and, in addition, the feathers prevent the cooling effect of air currents by the creation of a zone of still air imprisoned in their interstices. This protective area can be thickened at will when the fowl fluffs up its feathers, thus deepening the zone of still air surrounding the body.

Protective.—Skin and feathers protect the underlying tissues mechanically. The skin also is impervious to some liquids and gases that otherwise would be harmful and the feathers prevent direct moisture and sunshine from reaching the skin.

Sensory.—By its numerous nerve endings the skin supplies rapid information of change in its environment, e.g., temperature, pain, and enables the bird to make the necessary response, e.g., movement.

In addition, of course, the feathers assist in both flight and running, and by their diversified colouring and shape supply the external differences between the sexes. When it is considered that the whole feather covering is changed yearly and that it represents 4 to 9 per cent. of the body weight, it is apparent that it is an important item in the bird's annual production.

Feathers are the most important of the specialized skin structures. As well as protecting the bird they help to maintain the body temperature and are essential to flight.

A typical feather consists of a shaft (axis or scapus) and a web (vane or vexillum). Each feather grows from a papilla on the skin and is capable of being raised or lowered by small muscles attached to the base.

The free part of the shaft is the quill, and that supporting the web the rhachis. The quill is hollow and the rhachis solid and four-sided, tapering, and pliant. The web is made up of slender vanes (barbs) set obliquely to the rhachis. Each interlocks with its neighbours by means of slender barbules on each side. The edges of the barbules are provided with minute hooks which interlock with one another. By this means the web becomes matted into a continuous sheet capable of withstanding the pressure of the air in flight. Feathers, other than the true tail feathers and the primaries and secondaries of the wing, are considerably modified

to adapt themselves to the various parts of the body they cover. The down feathers have no barbules for interlocking. A flight feather, with a web 6 inches long, has some 1,200 barbs and about 1,000,000 barbules, besides an immense number of the microscopic hooks which are attached to each barbule.

MUSCULAR SYSTEM.

The flesh of poultry is composed of *voluntary muscles* similar to but paler in colour than those of the ox and sheep. The internal organs contain small quantities of *involuntary muscles,* so called because they are automatic in action and not under the direct control of the will. The *heart muscle* is a special sort of involuntary muscle.

The voluntary muscles do the active work of the body and are attached at one end—called the *origin*—to the central framework of the skeleton and thence run outwards to be attached by tendons, or directly to the bones they are to move. (This end is called the *insertion.*) Where tendons run over joints or bones they are held in position by bands of fibrous tissue or ligaments.

The *Diaphragm.*—This muscular partition between the chest and abdomen of mammals is almost entirely absent in poultry.

The *Pectoral Muscle* is the largest of the body and, with the smaller supracoracoid underlying it, makes up the breast of the fowl and is equal in weight to all the remaining muscles. The *origin* is the sternum and adjacent parts, and *insertion* is in the humerus, near the shoulder joint. The *action* of the pectoral muscle is to depress the wing in flight; hence the necessity for its great size, even in those birds which no longer fly but still use their wings in fighting and running.

The *Supracoracoid Muscle* has its origin in that part of the sternum which is not occupied by the pectoral muscle. The *insertion* is by means of a rounded tendon through the shoulder joint to a point opposite the insertion of the pectoral muscle on to the humerus. The *action* is opposed to that of the pectoral muscle—*i.e.,* it raises the wing in flight.

The *Ptagium* is a fold of skin stretching between the ribs and the arm and forearm. It contains elastic fibres and muscles and assists in folding the wing.

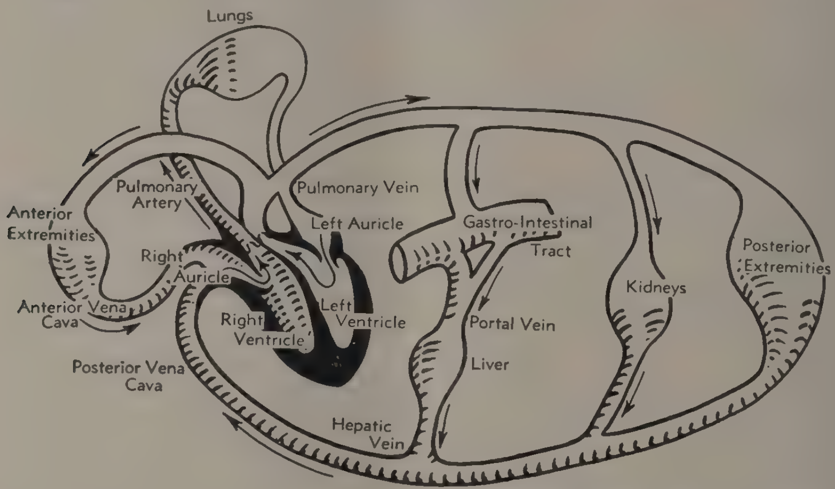
The leg muscles are small and numerous. Their tendons often become ossified in old birds and hence are best removed when dressing poultry for the table. Bending of the joints of the legs, as in perching, causes the toes also to flex, due to a pulley-like action of the long tendons over the tibio metatarsal joint, thus maintaining the grip during sleep.

The involuntary muscles are small in bulk but widespread throughout the body, occurring in the walls of hollow organs, such as blood vessels and stomach, intestines, &c. Their functions are automatic and consist in maintaining the continuous processes of digestion, circulation, excretion, and so on of the healthy body.

THE CIRCULATORY SYSTEM.

The circulatory system consists of the heart, arteries, veins, and blood. The heart is a muscular pump supplied with valves, which sends the blood in a continuous stream throughout the arteries to all parts of

the body. Thence it is returned by thin-walled tubes (the veins) to the heart. The arteries have thicker walls than the veins as they contain elastic and muscle fibres. The heart is relatively large. It is enclosed in a membrane—the pericardium—and is situated between the lobes of the liver. Communication takes place between the terminations of the arteries and veins by hair-like tubes called capillaries. The chief vessels leaving the heart may be seen in Plate 64.



(*after drawing in "The Physiology of Domestic Animals" by H. H. Dukes, D.V.M., M.S.*)

Plate 63.
THE CIRCULATORY SYSTEM.

The blood consists of the following elements:—

Plasma.—A pale fluid, which conveys the red and white cells;

Red Cells.—(Erythrocytes) which contain a red pigment called haemoglobin, and are carriers of oxygen;

White Cells.—Fewer and larger than the red cells. They have the power of destroying injurious invaders of the blood.

The function of the circulatory system is to supply freshly oxygenated blood to all parts of the body. In addition to oxygen the blood contains nutrient substances in soluble form for the nourishment of the tissues. The venous blood on its return carries waste products and burned oxygen in the form of carbon dioxide for excretion through the lungs. If reference is made to Plate 63 it will be seen that freshly oxygenated blood reaches the left side of the heart by the pulmonary arteries. From that it is pumped along the great vessels to reach the most distant parts of the body. In the digestive tract it receives nutrients which are delivered to the liver, where they are purified and made more assimilable, and thence reaches the venous stream and the right side of the heart. In the kidney certain waste products are collected and discharged through the ureters. All returning venous blood enters the right side, and from there passes to the lungs, where oxygen is received and moisture and carbon dioxide is given off. From the lungs the purified blood bearing its load of nutrients returns to the left side of the heart, thus completing the cycle.

The heart is composed of cardiac muscle, and is under involuntary nervous control. It contracts at a very rapid rate—normally about 300 beats per minute.

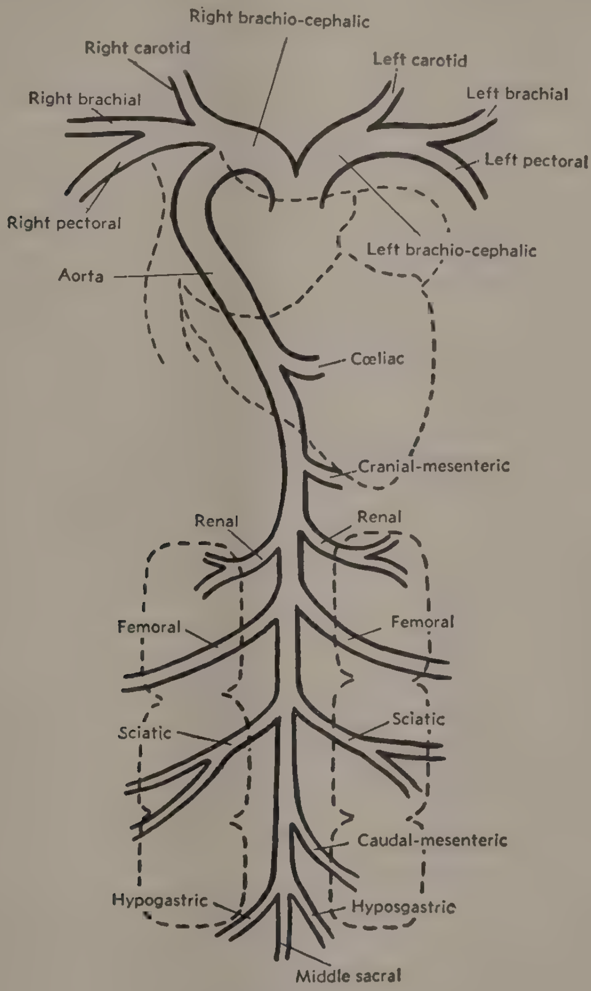


Plate 64.
DIAGRAM OF CHIEF ARTERIES.

RESPIRATORY SYSTEM.

The respiratory organs consist of the nostrils, glottis, upper or superior larynx, the trachea, the lower larynx or syrinx, the bronchi, air sacs, and the lungs.

Nostrils are small openings at the base of—and on both sides of—the beak, connected to the opening (slit) in the roof of the mouth.

Larynx.—The larynxes are valves at both ends of the trachea, known as the *upper,* situated near the base of the tongue, and the *lower,* situated

at the junction of the trachea and bronchi. The lower is at times termed the *syrinx*, or true larynx, by virtue of its being provided with vocal cords. The upper is much larger than the trachea, it being a very hard, cartilaginous or bony structure and operated by strong muscles. The lower larynx is of cartilage and is flattened.

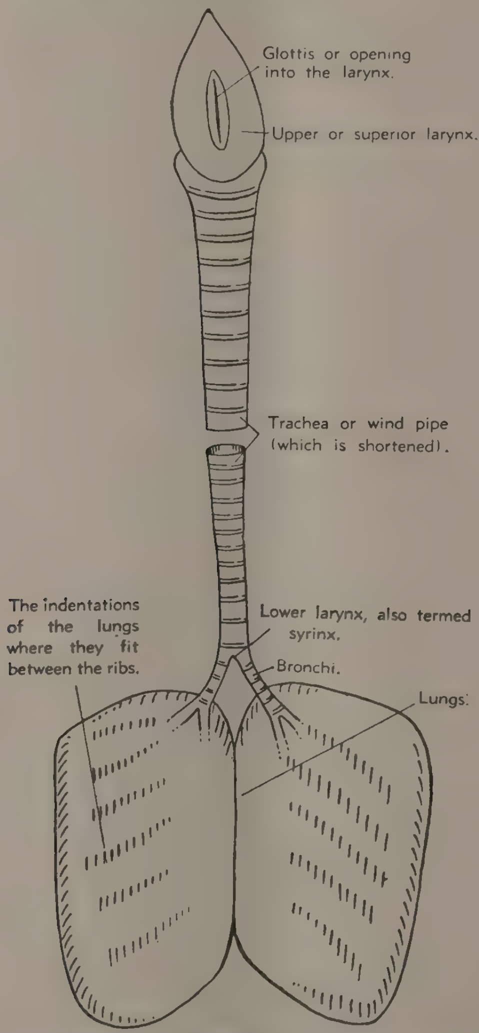


Plate 65.

ORGANS OF RESPIRATION.—An Explanation of the Trachea and Lungs.

Trachea.—Commonly known as the windpipe, made up of numerous round rings of cartilage joined by narrow membranous ligaments.

Bronchi.—The trachea divides at the lower larynx into two tubes known as bronchi, one going to each lung.

Bronchioles are further subdivisions of the bronchi, which form into air cells of the lungs. Other bronchial tubes supply air to the air sacs of the body.

Air Sacs.—These are nine in number, communicating with the bones of the limbs and body on the one hand and with the bronchi on the other. They confer lightness and buoyancy to the body. The air sacs are named as follows:—

A single *clavicular* sac, placed behind the clavicle bone and continued on each side as an *axillary* sac, which supplies air to the sternum, sternal ribs, shoulder girdle, and humerus.

Above and behind the clavicular sac are two *cervical* sacs, which supply air to the thoracic vertebrae.

Then there are two *thoracic* sacs, which do not supply air to any bones.

Encasing the abdominal organs are two large *abdominal* sacs, which supply air to the sacrum, hip bone, and femur.

Air sacs are developed to a greater degree in flying and water fowls than in running birds.

Lungs.—The lungs, bright-pink and sponge-like, are applied closely to the under side of the back. They reach from the first rib in front to the kidneys behind. They are composed of air cells lined with a thin membrane and richly supplied with blood. Through this membrane takes place the interchange of gases between the blood and the inspired air, which gives fresh oxygen to the blood and removes the used-up air in the form of carbon doixide. The air cells are supported in a sort of elastic network.

The respiratory system of birds differs greatly from that of other animals; the lungs are small and the bony wall surrounding them cannot expand, so that the active part of breathing is *expiration* and not *inspiration,* as in man. The air sacs are peculiar to birds, and with the hollow bones form an extensive reservoir of air in communication with the lungs.

In breathing, air is drawn through the nostrils and enters the mouth through the slit in the hard palate. Thence it passes through the cranial larynx down the trachea to the syrinx, which is the true sound-producing organ. The bronchi conduct the air from here to the lungs.

Through the thin membrane lining the air cells fresh oxygen passes to the blood, and from it moisture and carbon dioxide pass to the air cells and are exhaled through the contraction of the involuntary muscles, which form part of the framework of the lungs. The lungs are restored to their former size after breathing out by their elastic fibres, and so the process is repeated.

Birds may occasionally breathe through the open mandibles, but it is generally a symptom of some obstruction of the respiratory tract or else because of very hot weather and an endeavour to increase the rate of cooling of the body.

THE DIGESTIVE SYSTEM.

The digestive system consists of the following organs:—

Mouth.—Containing the tongue and the glands, which supply moisture to enable the bird to swallow food.

Tongue.—Narrow and pointed. The tip is horny and the rear part carries a transverse row of simple, large, and horny papilla (a nipple-like protuberance) directed towards the gullet. There are also similar papilla on the roof of the mouth.

Oesophagus.—Is the tube leading from the mouth to the proventriculus, interrupted by the distension known as the crop. The oesophagus is frequently termed the gullet.

Crop.—The food reservoir formed by a one-sided distension of the oesophagus, situated in front of the base of the neck and lying to the right. The crop may contain, with comfort, from 4 to 6 oz. of food, due to the elasticity of its walls. From the mouth to the crop there are numerous glands secreting juices which, while not of a digestive nature, tend to moisten and soften the food. The crop itself is glandless.

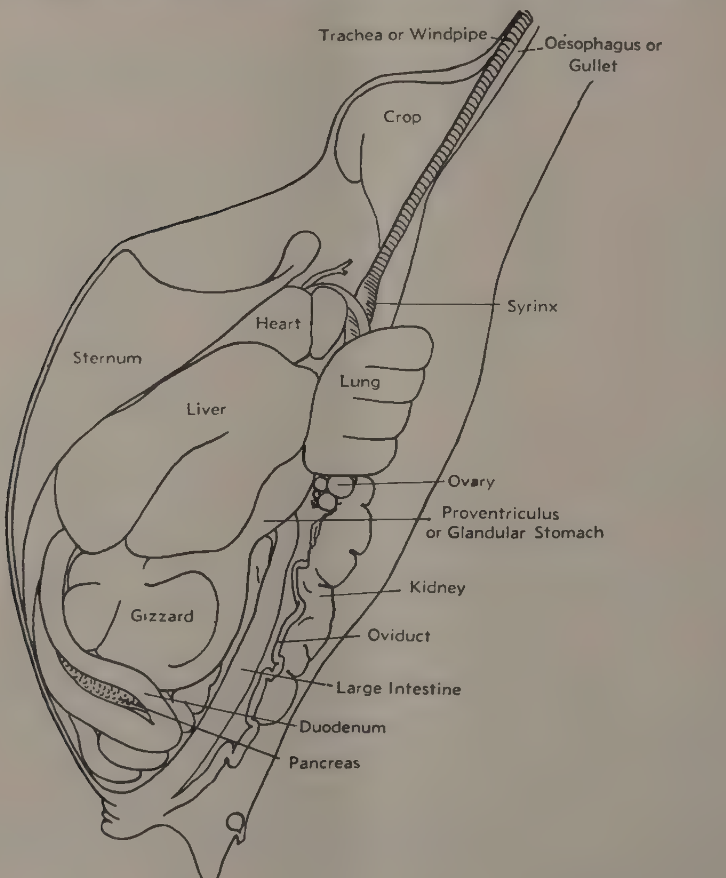


Plate 66.
THORACIC OR ABDOMINAL VISCERA.

Proventriculus.—Commences about 2 inches to 3 inches from the crop and extending to the gizzard. It is enlarged, being about $\frac{3}{4}$ inch in diameter, and is from $1\frac{1}{2}$ inches to 2 inches in length; the walls are thickened and on the inner lining there are a large number of glands; it is also called the glandular stomach.

Gizzard.—The largest single organ of a fowl, located next to the proventriculus; of great muscular strength, reddish in colour, of uneven

shape. The inner lining is thick and horny and raised into ridges. Grit is collected in this organ to aid in the crushing and grinding of food.

Liver.—Is the largest gland in the body and consists of two lobes —right and left—more or less flat, very thin at the edges. It is situated behind and below the heart and is reddish-brown in colour.

Gall Bladder.—Is attached to the liver between its two lobes and is an elongated, greenish organ. Two ducts carry bile from it into the duodenum.

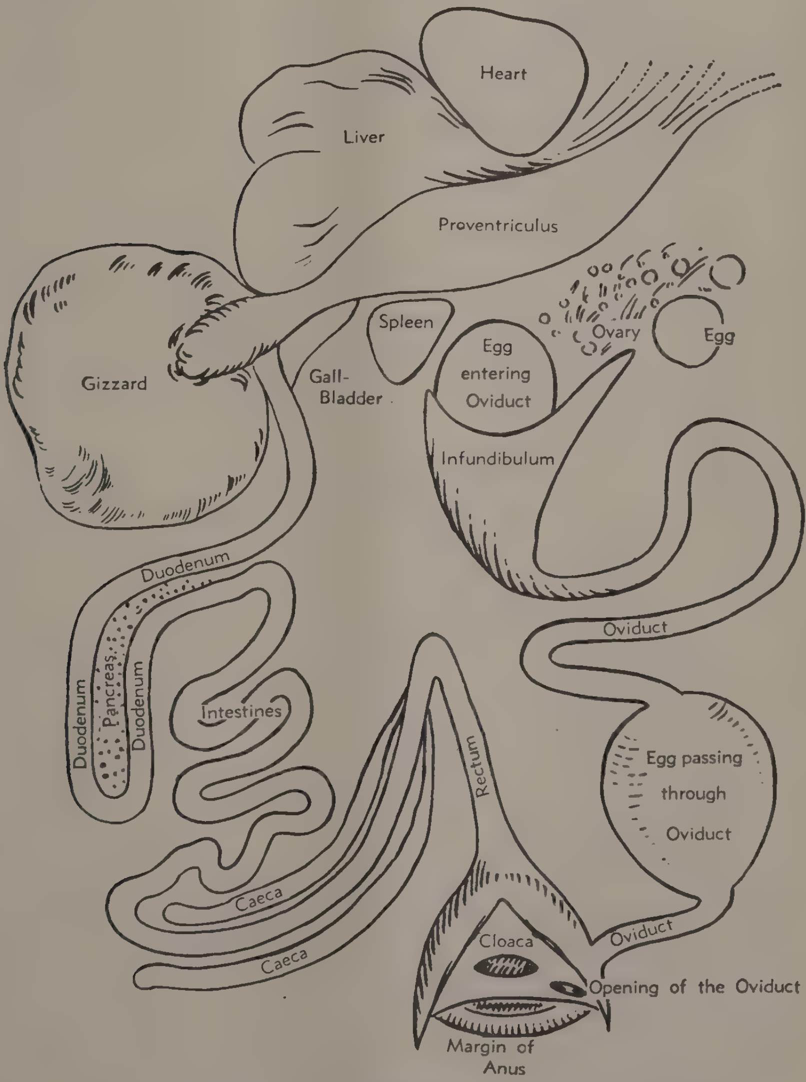


Plate 67.

ORGANS OF DIGESTION AND REPRODUCTION.

Pancreas.—A long, creamy-white coloured organ about 5 inches in length, suspended in the loop of the duodenum. Several ducts carry its secretion into the duodenum.

Mesentery.—A thin membrane attached to the small intestines, containing lymphatic and blood vessels.

Duodenum.—The first portion of the small intestines, attached to the gizzard. It is in the form of a loop, which supports the pancreas.

Jejunum and Ileum.—That portion of the intestines from the duodenum to the junction of the caeca.

The whole length of the small intestine is lined with intestinal glands, which secrete digestive juices.

Caeca.—The two tubes situated at the junction of the small and large intestines; these are 5 inches to 7 inches long, often referred to as "blind guts."

Large Intestine.—Is very short, slightly thicker in diameter than the small intestine. It continues in a straight line from the small intestine as the *colon* to the *rectum* and terminates in the *cloaca.*

Cloaca.—Is the terminal dilation of the large intestines and is common to the digestive, reproductive, and urinary organs. It, therefore, has the following important functions to perform:—To receive and excrete the undigested food and waste products from the kidneys; the passage of eggs; and the reception of sperm from the cock in copulation.

Vent.—The exit of the cloaca.

Before food can be digested it must be broken down into small fragments, and, as the fowl does not possess teeth, this function is performed by the gizzard, which uses its gritty contents as a sort of mill. Were it not for this, the tough covering of the various grains which are swallowed whole by the fowl would prevent their digestion by the secretion of the digestive organs.

These secretions are prepared by different parts of the digestive tract, beginning with the mouth. Their function is to convert the non-digestible foodstuffs into digestible particles, which can be absorbed into the blood-stream through the innumerable, fine, hair-like villi that line the small intestine.

Of the food entering the fowl, some is used for supplying energy, some for growth and maintenance, some for production—*e.g.*, eggs and feathers—some is stored in the muscles, liver, and fat, and the balance—mostly consisting of indigestible substances, such as fibre—excreted as waste. If the crop and gizzard are empty, as when the bird has not been fed for some hours—the first food seized passes directly to the gizzard in about thirty seconds. If the gizzard is occupied with grinding, food is stored in the crop and passes onward only as required. This mode of entry is a means of protection, a legacy from a wild ancestor, enabling the bird to fill the crop rapidly on the ground and then return to a tree to digest it in safety.

To reach the gizzard food must pass through the proventriculus, but stays there only a few seconds.

After being ground in the gizzard, the food reaches the small intestine and passes slowly along it by means of rhythmical contractions of

its walls. The two blind caeca at its junction with the large intestine also contract and expand and seem to increase the fluidity, so that the contents pass easily to the cloaca where they accumulate and are ejected from time to time. In the laying hen, from the time food is picked up approximately two and a-half hours is needed for its unabsorbed portion to reach the cloaca. In the non-laying hen, this period is increased to about eight hours and in the broody hen is longer still, being in the neighbourhood of twelve hours.

Below are summarized the processes taking place in the different parts of the digestive tract—

Mouth and Gullet.—The ferment ptyalin begins the conversion of starches into maltose;

Crop.—The conversion of starch is continued;

Proventriculus.—The ferment pepsin begins the conversion of proteins into simple forms;

Gizzard.—All the above processes are continued during the grinding;

Small Intestine.—A number of secretions from the pancreas and small intestine itself complete the conversion of starches and proteins into available forms—*i.e.*, glucose and amino acids and also change fats, which have reached here largely unchanged, into available fatty acids.

Absorption of these available forms then takes place through the villi that line the small intestine, and the waste products pass to the exterior via the large intestine and cloaca.

Digestion is rarely complete, and absorption still less so, especially when overfeeding is associated with lack of exercise or the food ration is an unbalanced one, or when both these conditions occur simultaneously.

URINARY SYSTEM.

The two *kidneys* are closely applied to the dorsal wall of the abdomen behind the lungs. Each is divided into three or four lobes and is joined to an opening in the cloaca by a comparatively straight tube—the *ureter*. The substance of the kidney is formed of numerous fine tubules, whose ducts coalesce to discharge their contents into the ureters and by this means reach the cloaca. The kidney is very richly supplied with blood.

Certain waste products are collected from the blood-stream by the kidneys and excreted with the cloacal contents as a whitish, pasty mass, which is the equivalent of urine in other animals.

THE REPRODUCTIVE AND GENITAL ORGANS.

Female.—Only the left ovary and oviduct reach maturity, though both right and left are present in the embryo.

The ovary lies below the front half of the kidneys. It is composed of a number of rounded, yellowish bodies (ova) in different stages of development. If examined in the laying season there will be all stages up to that in which the ripe ovum—the yolk of the completed egg—is ready to be released into the oviduct.

Each ovum is surrounded by its own vitelline membrane and is attached to the ovary by a thin membranous envelope—the follicle. The whole ovary is so surrounded by other organs as to be in a sort of pocket —the only escape from which is through the expanded end of the oviduct—the *infundibulum.*

There may be 3,000 or 4,000 ova present in the ovary at one time.

The oviduct is a coiled tube extending from the infundibulum, in the vicinity of the ovary, to its opening into the cloaca. It is of varying diameter, and may be divided into five parts, some of which secrete the albumen, membranes, and shell which are necessary to complete the egg.

These parts are named as below:—

(1) Infundibulum—approximate length, 2 inches.
(2) Magnum—approximate length, 14 inches.
(3) Isthmus—approximate length, 4 inches.
(4) Uterus—approximate length, 5 inches.
(5) Vagina—approximate length, 5 inches.

The oviduct is supported by membranous dorsal and ventral ligaments. Its wall contains muscular tissue, which increases towards the cloacal termination, and is greatest in the walls of the uterus. The magnum, isthmus, and uterus contain glands which secrete the albumen (white) shell, membrane, and shell, respectively, during its passage to the exterior. In a non-laying hen the oviduct may be only 4 inches long and $\frac{1}{4}$ inch wide, whereas in full lay it may increase to 20 inches in length, with corresponding breadth.

The functioning ovary contains ova at all stages from the microscopic to the rounded yellow "yolk" ready to be fertilized, and about to be released into the infundibulum.

This release is effected by rupture of the fine membrane—the follicle—investing it.

Once received into the beginning of the oviduct, the ovum is surrounded by fluids containing innumerable spermatozoa. Several of these may pierce the germ spot, but only one unites with the female cell contained in it to form the fertilized cell from which the chicken will develop.

Progress down the oviduct is maintained by wave-like contractions of the muscular wall. The whole time spent in the oviduct is about twenty-five hours, as shown in the table below:—

Section of oviduct	Process occurring	Time spent
Infundibulum	Fertilization	approx. $\frac{1}{4}$ hours
Magnum	Deposition of thick albumen ..	" 3 "
Isthmus	Formation of shell membranes ..	" $1\frac{1}{4}$ "
Uterus	Formation of thin albumen and deposition of shell	" $20\frac{1}{2}$ "
		25

The egg passes to the vagina from the uterus when it is ready for laying, and normally its stay there is only a matter of minutes.

As a rule, ovulation—that is, the release of the next yolk into the mouth of the oviduct—follows the laying of the egg at an interval of about half an hour.

In the magnum, which comprises about half the length of the oviduct, the thick albumen is deposited on the yolk. It equals about half the total "white" of the completed egg, and can be plainly seen in a fresh egg broken into a dish as it stands up as a sort of plateau around the yolk, while the thin albumen flows around its base in a thin sheet. In stale eggs this differentiation is not noticeable.

In the Isthmus the shell membranes are formed. They are loosely applied, as they must leave room for the balance of the white which is to come.

In the Uterus the secretion of the thin white through the porous shell membranes, and the deposition of the shell, take place simultaneously in the early stages. The secretion of the thin albumen—some 40-50 per cent. of the total "white"—occurs in the first few hours, and the balance of the twenty odd hours spent here suffice to complete the shell ready for laying.

Male.—The two testes each have a tube—the deferent duct—leading to a small eminence on the wall of the cloaca. They are egg-shaped bodies placed ventral and anterior to the kidneys. The left is often larger than the right, and their size increases during the breeding season. The medial border of each is slightly concave. From this arises the "deferent" duct, which pursues a wavy course lateral to the ureter to open into the cloaca, on a small papilla.

Each testis is composed of much-coiled tubes—the seminiferous tubules—lined with epithelium from which the sperms are derived.

The male reproductive cells—spermatozoa—produced in the testis become motile in the deferent duct. Each duct terminates on a papilla on the dorsal wall of the cloaca, and is capable of injecting a large number—up to several million male cells—into the cloaca of the female during copulation. These spermatozoa then pass up the oviduct and occupy the infundibulum when the ovum is engulfed in it after ovulation. Only one of the male cells penetrates the germ spot and unites with it to form the fertilized ovum, from which will develop the chicken.

Male cells can live for about ten days in the oviduct, but then rapidly disappear, though fertile eggs have been obtained twenty-one days after the last mating.

The male cells, although microscopic in size, resemble a tadpole in appearance, and their long motile tail enables them to progress up the oviduct so rapidly that a fertile egg may be obtained twenty-four hours after mating. But in practice five-seven days is allowed before a high percentage of fertile eggs may be counted on.

THE EGG.

The shell consists of three layers and is porous. Externally is a delicate membrane, the shell cuticle or *bloom*. Beneath this is a spongy layer of calcareous fibres, and beneath this again is the *mammillary layer* consisting of conical masses of calcareous material, with air spaces between them.

The shell membrane lies between the shell and the white. It consists of two layers, which are closely applied to the shell and to one another, except at the large end, where they separate to form a space of variable size—the *air chamber.*

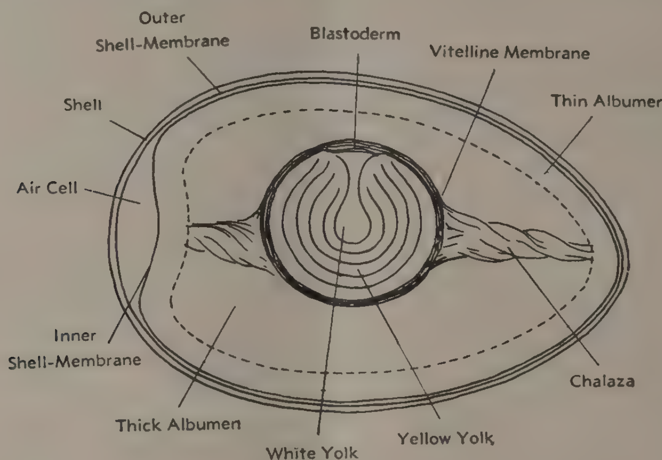


Plate 68.
THE EGG.

The albumen or white of the egg occupies the space between the shell membranes and central rounded yolk. Two cord-like thickenings of albumen arranged about the long axis and attached to the vitelline membrane are called the *chalazae.* About half of the white is formed of dense albumen surrounding the yolk and chalazae. Outside this is a more fluid layer, constituting the balance of the albumen.

The *yolk* is surrounded by its vitelline membrane. It is spherical, and composed of yellow and white material. The latter is arranged as a central flask-shaped mass and thin concentric layers separating thick layers of yellow yolk. A disc-like pale patch, about three-sixteenths inch in diameter on the yolk, is the *blastoderm,* or germ spot, a group of cells from which the chicken develops in incubation. In whatever position the egg is placed, this area is found at the top.

ENDOCRINE GLANDS.

These glands have no ducts of their own, but are usually well supplied with blood, and by this means their secretions reach the main blood streams.

They have a profound effect on the appearance and function of the bird. An example of this is seen in the cockerel whose testes are removed, resulting in the loss of most of the male characteristics. Their secretions are called hormones. They are essential to the normal function of all animals. The chief ones in the fowl are—

The testes—already described.

The ovary—already described.

The thyroid.—This gland is composed of small oval paired bodies located just within the thorax close to the jugular veins.

The spleen is a small, reddish-brown, rounded organ lying immediately to the right of the junction of the gizzard and true stomach. It is very richly supplied with blood by the splenic artery.

The thymus.—A lobulated body extending the length of the neck. It is only well developed in chickens and diminishes in size with age.

The adrenals are paired oval bodies about ½ inch long, lying medial to the anterior lobe of the kidneys.

The hypophysis or pituitary body is a small rounded mass attached to the base of the brain by a hollow stalk.

(TO BE CONTINUED.)

FOR ANGLE POSTS.

"The correct manner to stay an angle post is that adopted by the Post and Telegraph Department and the electric power boards. They have a far greater

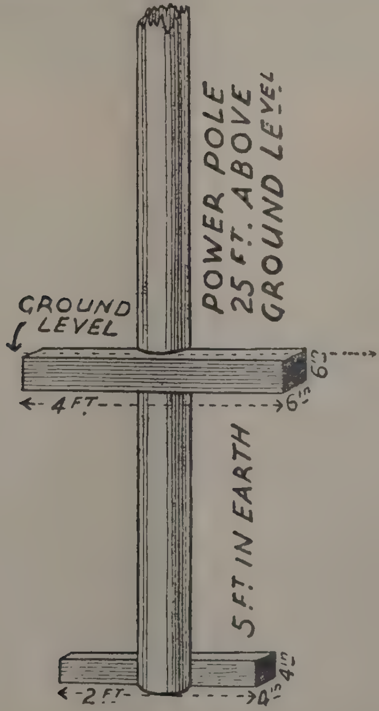


Plate 69.

leverage on a 30-foot power pole than a 4-foot fencing post, and they don't use a stay or strut. The sketch illustrates the method used."—"Ponga," in *The New Zealand Farmer Weekly.*

Seed Treatment of Sorghums.

R. B. MORWOOD, M.Sc., Research Officer.

WITH the recent increase in the popularity of sorghums as a crop, both for fodder and grain purposes, greater attention has been drawn to their diseases. One of these—covered kernel smut caused by the fungus *Sphacelotheca sorghi*—appears to be on the increase. While no great loss has yet been reported due to this disease, it is as well to take precautionary measures before such occurs. Accordingly, an experiment was laid out in the 1940-41 season to test the standard seed dust treatments on sorghum seed. The variety Wheatland Milo was used, the seed being first heavily dusted with spores from a mixed collection of smutted sorghum heads made the previous season. Five different dust treatments were carried out on samples of the smutty seed, and, together with an untreated control, they were planted in plots of two rows half a chain long. The plots were randomised and replicated four times. The dusts were applied at the rate of 2 oz. per bushel.

Results were obtained by counting the total heads and the smutted heads in each plot. The average percentage of infected heads for each treatment is given in the following table:—

TABLE I.

Treatment.	Percentage Infected Heads.	Significantly Better than—
(1) Copper carbonate	0·4	4–5–6
(2) Mercurial dust A	0·4	4–5–6
(3) Mercurial dust B	0·8	4–5–6
(4) Cuprous oxide	2·8	5–6
(5) Mercurial dust C	9·0	..
(6) Nil	10·8	..

The three leading dust treatments are considered to be effective measures for the control of the disease, and if they are used by farmers planting sorghums this crop should soon be free from smut. The two effective mercurial dusts are the only two in common use on wheat and other seed in Queensland being Agrosan and Ceresan. The choice of either of these or of any reliable brand of copper carbonate rests with the farmer concerned.

Summary.

Sorghum smut has become somewhat prevalent in this State, but it can be controlled by the dust seed treatments which are used for covered smut of wheat.

The Brisbane Exhibition.

Plate 70.
THE GRAND PARADE.

Plate 71.
ANOTHER SECTION OF BRISBANE'S PICTURESQUE SHOW ARENA.

Plate 72.
THE WINNING "A" GRADE DISTRICT EXHIBIT.

Plate 73.
The Winning "B" Grade District Exhibit.

Plate 74.

THE FIRST PRIZE DISTRICT FRUIT EXHIBIT.

Plate 75.

PRODUCTS OF A FRUITFUL LAND.—This display, arranged by officers of the Fruit Branch of the Department of Agriculture and Stock, illustrated the remarkable range of temperate and tropical fruits for which Queensland is justly renowned.

Plate 76.

THE WOOL ALCOVE IN THE COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

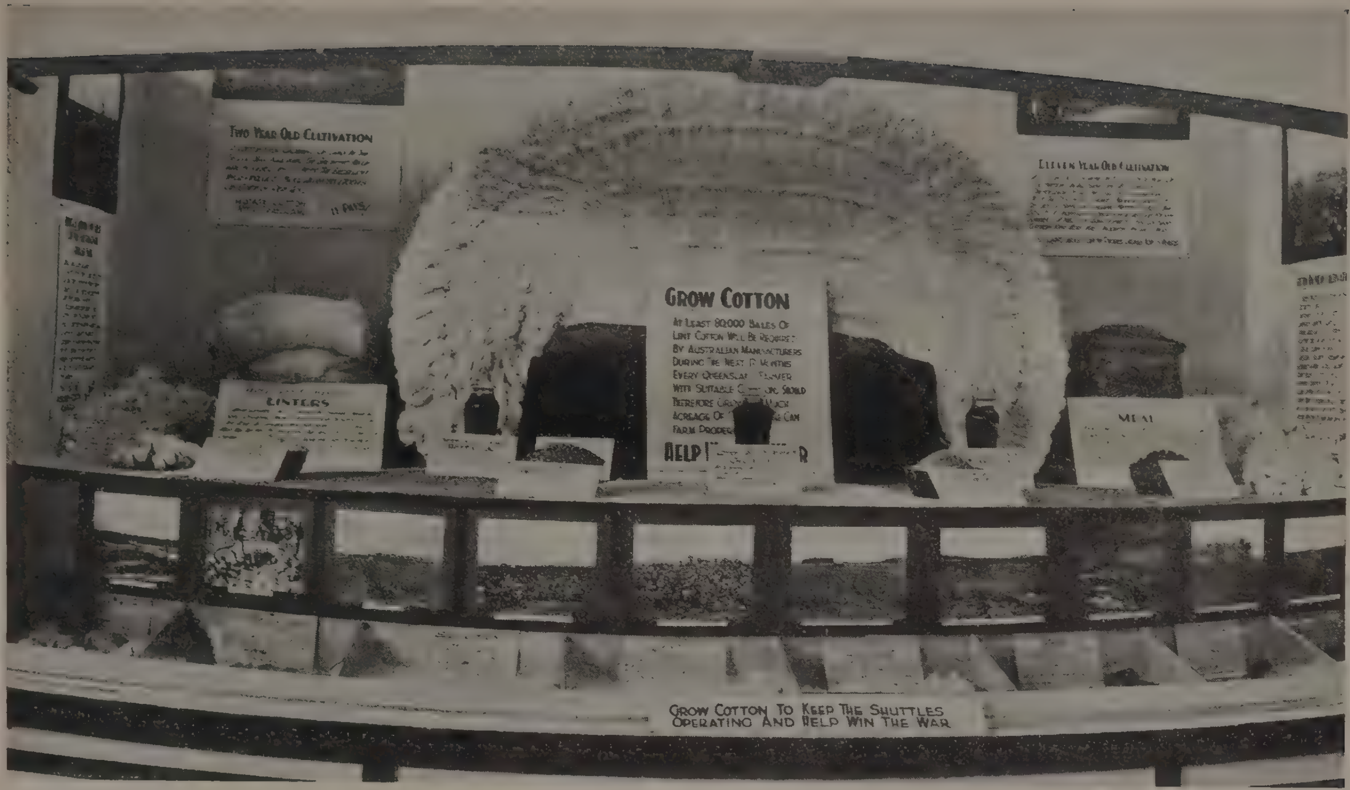


Plate 77.

FROM THE GINNERY TO THE SPINNERY.—Queensland cotton is produced for Australian industry, and this display arranged by officers of the Cotton Branch showed the quality of the home-grown fibre and the diversity and value of crop derivatives. For the cotton grower there is a guaranteed market and a guaranteed price. Farmers with suitable land are urged to plant as big a cotton acreage as they can properly cultivate.

Plate 78.

"GADGETS AND WRINKLES" OF SUCCESSFUL DAIRYING.—Popular interest centred on this section of the departmental display in the Court of Agriculture.

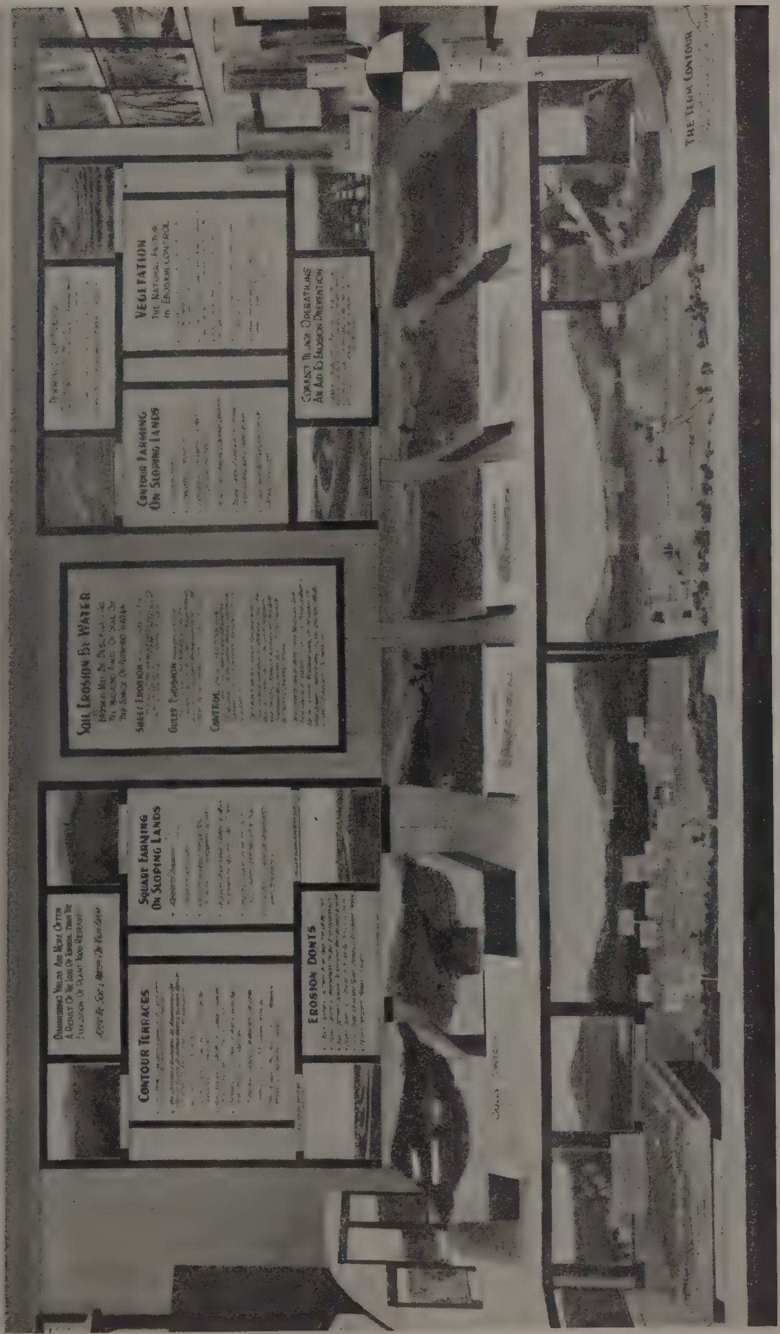


Plate 79.

Object Lessons in Sound Farming Practice.—Methods of soil security—the prevention of the washing of real wealth from ridge to river and the fertility which goes or blows with the wind—were demonstrated with landscape models in this alcove in the Court of the Department of Agriculture and Stock.

Plate 80.

PASTURE GRASSES AND POISONOUS PLANTS IN EDUCATIONAL CONTRAST.

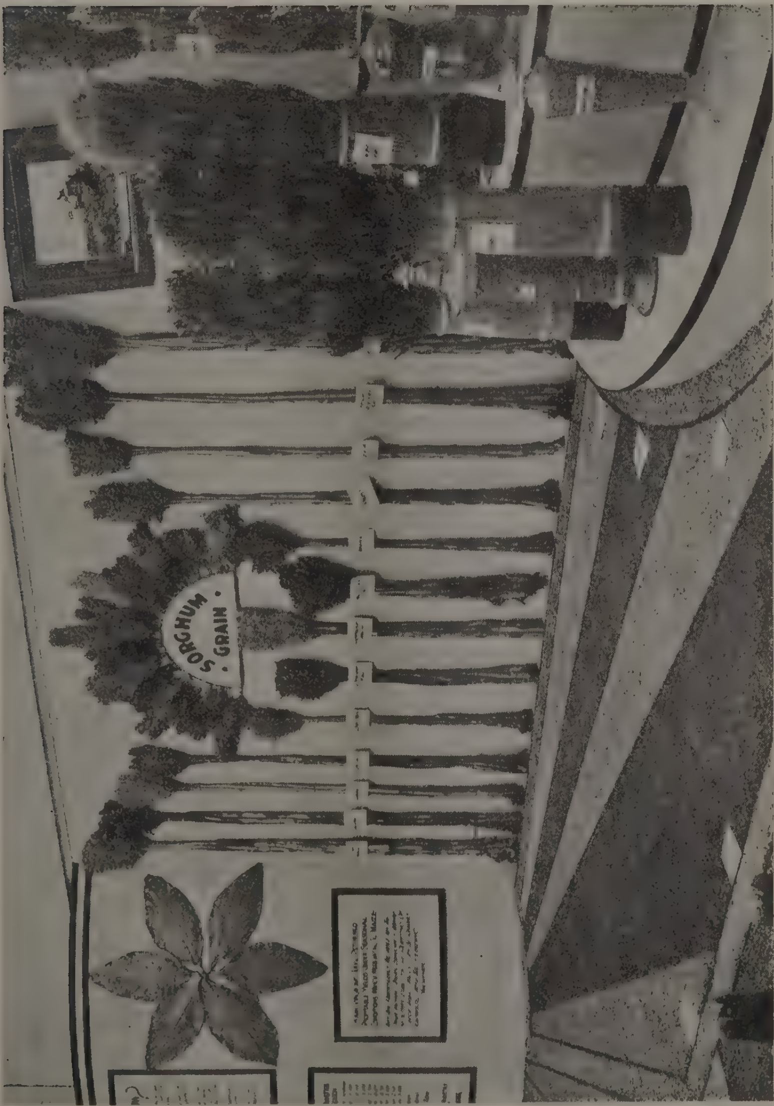


Plate 81.

An Array of Grain Sorghums in the Court of Agriculture.

Plate 82.

FODDER CONSERVATION ON THE FARM.—Models of various types of silos built by the Instructional Staff of the Agricultural Branch demonstrated impressively the efficiency and economy of this form of livestock insurance.

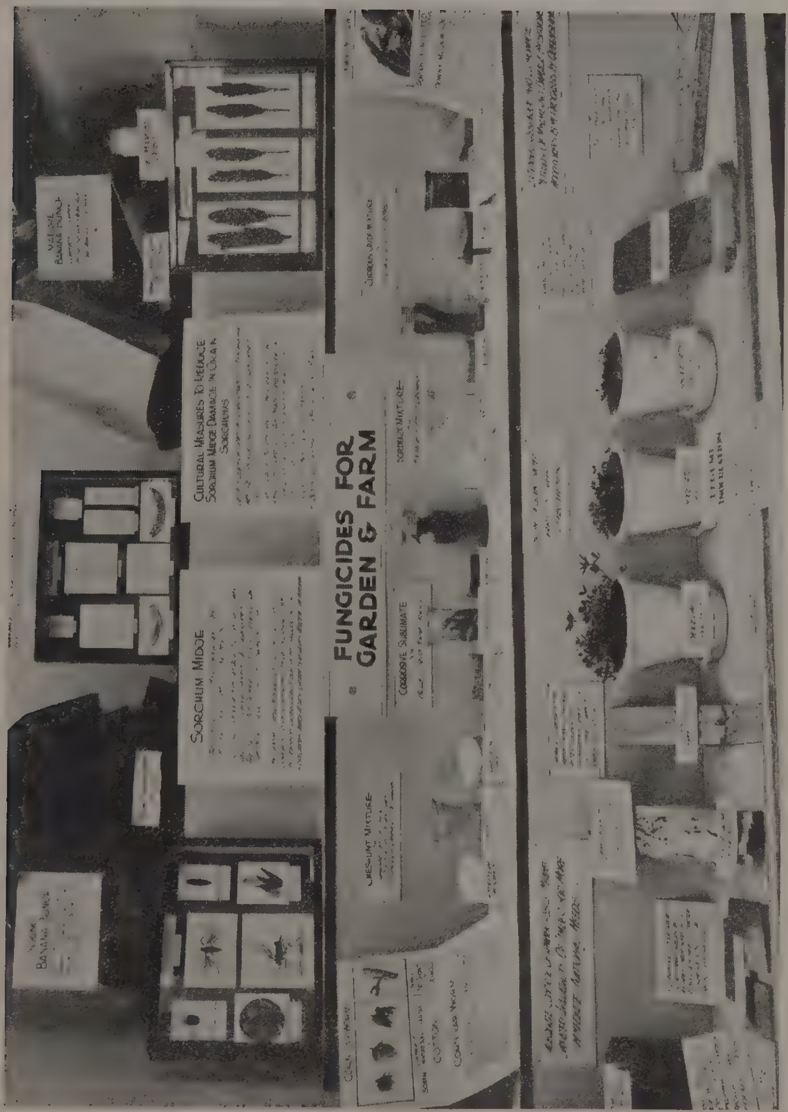


Plate 83.

LINKAGE OF SCIENCE WITH FARM PRACTICE.—Arranged by officers of the Research Division, this display illustrated impressively how pests and diseases of farm crops are effectively controlled.

Plate 84.
THE JOURNAL CORNER.—A well-organised and efficient information service was maintained throughout Exhibition Week.

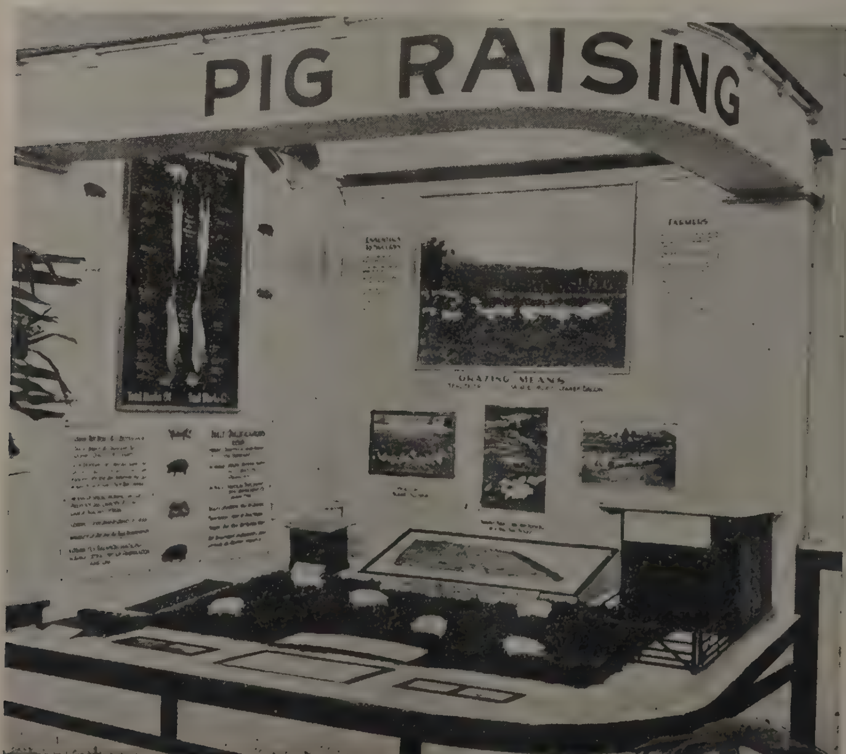


Plate 85.
POINTS IN PIGGERY PRACTICE WERE FITLY DEMONSTRATED IN THIS EXHIBIT.

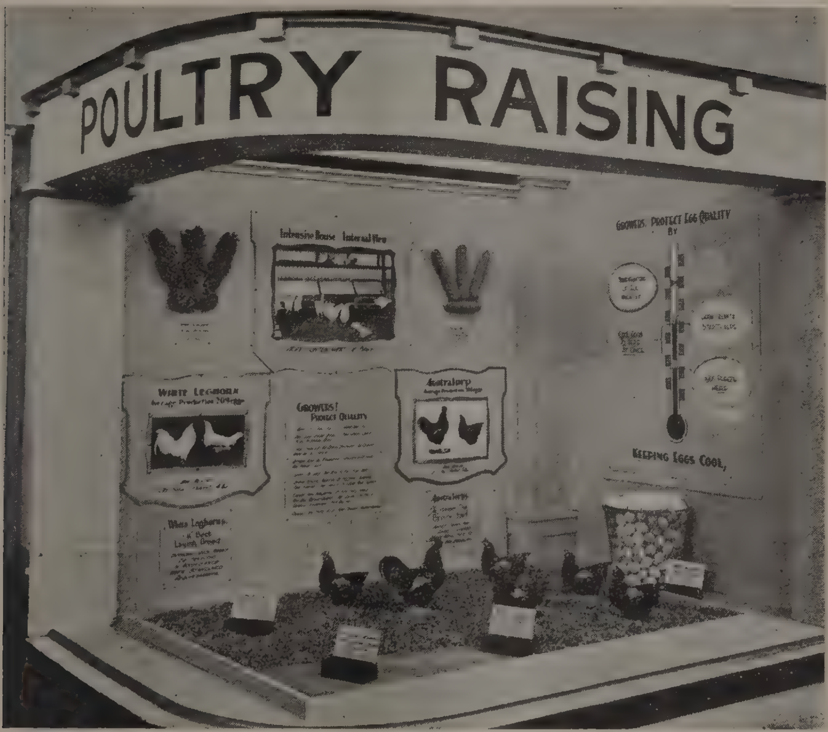


Plate 86.

The Poultry Alcove in the Court of Agriculture.

POINTS IN POULTRY FARMING.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual *per capita* basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
W. Brown, Waterworks road, The Gap, Ashgrove	Strathleven ..	White Leghorns
W. T. Burden, 44 Drayton road, Toowoomba	Harristown ..	White Leghorns, Australorps, and Rhode Island Reds
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca.. ..	White Leghorns and Australorps
W. C. Carlow, Upper Brookfield	Adaville ..	Australorps, White and Brown Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton ..	White Leghorns
W. Chataway, Cleveland ..	Wilona ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. M. M. Cousner, The Gap, Ashgrove	Progressive Poultry Farm	Australorps and White Leghorns
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
O. M. Dart, Brookfield	Woodville ..	White Leghorns, Australorps, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
T. Duval, Home Hill	Athalie ..	White Leghorns and Rhode Island Reds
E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
F. Farrier, Miller road, Birkdale	Glenwood ..	White Leghorns
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
C. and C. E. Gustafson, Tannymorel	Bellevue ..	White Leghorns, Australorps, and Rhode Island Reds

Name and Address.	Name of Hatchery.	Breeds Kept.
F. E. Hills, Sims road, Bundaberg	Littlemore ..	Rhode Island Reds, Australorps, White Wyandottes, White Leghorns, and Langshans
C. Hodges, Kuraby	Kuraby ..	White Leghorns
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensington ..	Australorps, Rhode Island Reds, and White Leghorns
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
Miss K. E. Jenkins, Phillip street, Sandgate	Brooklands ..	Australorps, White and Brown Leghorns
S. W. Kay, Cemetery road, Mackay	Kay's Poultry Stud	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
W. A. Lehfeldt, Kalapa ..	Lehfeldt's ..	Australorps
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps, White Leghorns, and Light Sussex
J. McCulloch, Whites road, Manly	Hinde's Stud Poultry Farm	White and Brown Leghorns and Australorps
W. S. McDonald, Babinda ..	Redbird ..	Rhode Island Reds and Anconas
F. W. McNamara, Vogel road, Brassall, Ipswich	Franmara ..	White Leghorns and Australorps
A. Malvine, junr., Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White and Black Leghorns
A. E. Mengel, Campbell street, Toowoomba	Glenmore ..	White, Black, and Brown Leg-Leghorns, Anconas, Australorps, and Rhode Island Reds
C. Mengel, New Lindum road, Wynnum West	Mengel's ..	Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	White and Brown Leghorns and Australorps
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale ..	White and Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Coopers Plains	Norups	White Leghorns and Australorps
C. O'Brien, Hugh street, Townsville	Paramount ..	White Leghorns and Rhode Island Reds
H. Obst and Sons, Shepperd ..	Collegeholme ..	White Leghorns and Rhode Island Reds
A. C. Pearce, Marlborough ..	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, and Langshans
E. K. Pennefather, Douglas street, Oxley Central	Pennefather's ..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
G. R. Rawson, Upper Mount Gravatt	Rawson's ..	Australorps
J. Richards, P.O., Atherton ..	Mountain View	Leghorns and Australorps
W. G. Robertson, Bilsen road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud Poultry Farm	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
W. B. Slawson, Camp Mountain	Kupidabin ..	White Leghorns, Australorps, and Light Sussex
Mrs. A. Smith, Beerwah.. ..	Endcliffe ..	Australorps and White Leghorns
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Teitzel's ..	White Leghorns and Australorps
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps,
P. and K. Walsh, Pinklands, via Cleveland	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's ..	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
H. M. Witty, Boundary road, Kuraby	Witty's ..	White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps

USES FOR OLD MOTOR TUBES.

Many uses can be found for a strip of rubber from an old motor tube.

The hands are apt to get sore when digging, hoeing, and doing many other jobs which call for constant friction. Cut two pieces of the rubber as shown in the sketch, so that they will slip over and protect the fingers and palms, while being held in place by the loops formed to grip the back of the hands.

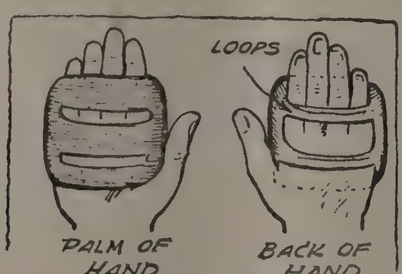


Plate 87.

Rings cut from a tube, slipped over the feet and up the legs keep the trouser bottoms from coming into contact with wet soil much more comfortably than the usual piece of string.

A number of strips twisted together and nailed to gate and post will act as a very efficient spring to keep the gate closed.

Two or three bands carried in the pockets will come in handy in a hundred odd ways when you are working about the garden, taking the place of string, wire, and nails in many places.

Packing Sheds and Equipment.

IN many deciduous fruit districts marketing activities are now at a minimum, and it is possible to overhaul, repair, replace, and add to the existing packing-shed equipment. Many growers carry on, season after season, with makeshift equipment, when, for a little time and a small expenditure of money, a properly-equipped packing shed could be furnished.

Packing stands, nailing-down presses and benches, sizing-machines, hammers, stencils, and other equipment should all be gone over and restored to a high state of efficiency. Simple designs for packing stands, nailing-down presses, and case-making benches can be procured, and are not hard to follow by anyone who is useful with a hammer and saw. Simple forms of sizing-machines can also be made at home, while those growers who have commercial machines should overhaul them thoroughly, tightening up all screws and bearings, and, if necessary, renewing the padding in the bins and feed channels. Broken parts should be replaced, and power plants overhauled. Broken handles in working tools should be renewed. Case end scrapers and packing needles should be sharpened and greased and packed away until required next season.

Complete sets of new stencils can be cut. A sheet of thin zinc, a small chisel, round and flat fine-grain files, a hammer, and a piece of end-grain hardwood are the necessary tools. The designs of the letters to be cut can easily be made by obtaining stencils, and copying them on to the zinc in the design wanted. The stencilled letters are then cut out of the sheet of zinc with hammer and chisel, and, in that way, an excellent stencil is made. Stencils are easily obtained, and there is no need to use blue crayon for marking cases.

When the overhauling of plant has been completed, growers should turn their attention to the cleanliness of the packing shed. Old cases and picking-boxes should be repaired or burned, a close inspection of the cracks and crevices being made for pupating insects, such as codling moths. Any shed-stored fruit which has rotted in the cases should be removed and destroyed and the cases thoroughly sterilized by completely immersing them in a 5 per cent. solution of formalin for at least one minute. Floors and other parts of the building affected by juice from rotted fruit should also be treated.

Close attention to these details will enable growers to make a clear start at the next harvesting period.

SELECTING THE DEEP SUCKER IN BANANA CULTURE.

At this period of the year banana plantations are making a flush of suckers. On the selection of the best sucker on each plant will depend the success of the following crop and the future life of the plantation.

The corm of a banana plant produces at least two rings of buds which, at growing periods, burst into growth. Of these, the top circle is about 2 inches from soil level and the lower circle is usually 2 or 3 inches below the top circle. Suckers from any of these buds do not send forth the correct follower.

At the base of the corm a bud is produced which bursts into growth at a particular stage in the life of the parent plant. From plantation trials extending over several years, it has been found that the parent plant sends out the correct follower sucker when it has made three-quarters of its growth.

The maturity of a banana plant is governed not by the time it is in the soil but by the nature of the conditions during its growth. The deep follower produced at the right stage by the parent plant has more vitality, and its roots are deeper, and it retains its sword leaves longer. The shallow follower, on the contrary, develops its mature foliage early and the corm rises above soil level, thereby preventing the effective functioning of its higher roots.

The careful digging out of a three-quarter mature plant will reveal the habit of sucker formation, both shallow and deep. If suckers are planted with the side of severance down-hill, the general experience is that the correct follower will invariably appear just where it is wanted—i.e., up-hill.

CULTIVATING NEW BANANA LAND.

The benefit to be derived from a through breaking-up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need for improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased or, at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

DRY weather conditions still continue in most fruit and vegetable districts, to the detriment of fruit and vegetable supplies. Growers are still urged to keep up the maturity of all fruits during the colder months, particularly to southern markets where the ripening of tropical fruits is not assisted by their winter conditions. Fruit at present should be carefully packed to a colour standard. These conditions will, of course, alter as the season advances into October, when care will need to be exercised in selecting less advanced fruit.

Prices during the last week of August were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 5s. to 9s.; Sixes, 7s. to 11s.; Sevens, 8s. to 13s.; Eights, 10s. to 14s.; Nines to 15s.

Sydney.—Cavendish: Sixes, 8s. to 12s.; Sevens, 9s. to 15s.; Eights and Nines, 12s. to 16s.

Melbourne.—Cavendish: Sixes, 9s. to 13s.; Sevens, 11s. to 15s.; Eights and Nines, 13s. to 16s.

Adelaide.—Cavendish: 12s. to 18s. per case. Some lines showing squirter.

Brisbane.—Sugars, 1d. to 4d. dozen. Inferior lines lower. Lady Fingers, 2d. to 9d. per dozen.

Pineapples.

Brisbane.—Smooths, 3s. to 6s. case; 1s. to 5s. dozen. Roughs, 4s. to 6s. case; 1s. to 5s. dozen.

Melbourne.—Smooths, 8s. to 12s. per case. Black heart prevalent.

Adelaide.—Smooths, 12s. to 15s. per case.

Custard Apples.

The season for this fruit is now at an end. Prices throughout the year have maintained high levels.

Papaws.

Brisbane.—Locals, 2s. to 4s. 6d.; Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. 6d. to 4s. 6d. bushel.

Sydney.—6s. to 10s. Some lines still arriving on the green side.

Melbourne.—8s. to 10s.; well coloured lines to 12s.

CITRUS FRUITS.

Oranges.

Brisbane.—Commons, 5s. to 8s.; Navels, 6s. to 9s.

Sydney.—Navels to 10s.

Melbourne.—Navels, 6s. to 12s.

Mandarins.

Brisbane.—Emperors, 8s. to 15s.; Scarlets, 10s. to 18s.; King of Siam, 9s. to 13s.

Sydney.—Emperors, 8s. to 11s.

Melbourne.—Emperors and Scarlets, 7s. to 14s.

Lemons.

Brisbane.—5s. to 11s.

Sydney.—8s. to 10s.; specials higher.

Melbourne.—7s. to 10s.; specials higher.

Grapefruit.

Brisbane.—4s. to 7s.

Sydney.—7s. to 11s.

Melbourne.—7s. to 12s.

OTHER FRUITS.

Avocados.

Brisbane.—8s. to 10s.

Strawberries.

Brisbane.—4s. to 9s. dozen. Many lines affected by rain.

Sydney.—9s. to 12s. 6d. dozen; trays, 2s. 6d. to 6s. Many lines affected by rain.

Passion Fruit.

Brisbane.—First grade, 8s. to 11s. half-bushel; Seconds, 5s. to 7s.

Tomatoes.

Brisbane.—Coloured, small, 4s. to 7s.; others, 8s. to 11s.; Ripe, 4s. to 8s.; Green—Locals, 3s. to 6s.; Northern, 4s. to 9s.

Sydney.—South Queensland: Special Coloured, 10s. to 13s.; Others, 6s. to 10s.; Bowen, 4s. to 10s.; specials higher.

Melbourne.—Queensland, 6s. to 8s. for repacks; West Australia, 5s. to 10s. half-bushel; Adelaide, 14s. to 17s. half-bushel.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 18s. to 25s. bag; inferior lower; Sydney, 12s. to 22s. bushel. Many inferior lines noted. These will assist in creating poor prices. Melbourne, 10d. to 1s. 2d. lb.

Peas.—Brisbane, 18s. to 22s. bag—values eased at week-end to 12s. to 15s.; inferior lower; Melbourne, 6d. to 9d. lb.

Cauliflower.—Small, 2s. to 4s. dozen; good lines, 6s. to 10s.; Stanthorpe, 10s. to 14s. chaff bag.

Cabbage.—6s. to 12s. dozen; specials higher.

Carrots.—6d. to 1s. 6d. bundle.

Beetroot.—6d. to 1s. 6d. bundle.

English Potatoes.—2s. 6d. to 5s. sugar bag.

Sweet Potatoes.—2s. to 3s. 6d. sugar bag.

Rhubarb.—1s. to 1s. 6d. bundle.

Marrows.—2s. to 5s. dozen; Sydney, 8s. to 10s. per case.

Pumpkins.— 5s. to 6s. 6d. bag.

Lettuce.—9d. to 3s. 6d. dozen.

VALUE OF LIQUID MANURE.

Value of the liquid manure from a herd of forty dairy cows would, in twenty-five weeks, reach a total of £50, or 25s. per cow, if fully conserved (says a Scottish investigator). Three and a-half tons of potash salts—now almost unobtainable—two and a-half tons of sulphate of ammonia, and a-half ton of superphosphate is estimated to be needed to make a dressing of artificials of equal manurial value. This is one of the reasons why every effort should be taken to see that liquid manure is used to the full on every farm.

General Notes

Staff Changes and Appointments.

The following officers of the Department of Agriculture and Stock have been appointed Local Supply Officers for the purposes of the "National Security (Emergency Supplies) Rules of 1941" at the centres mentioned:—Messrs. S. E. Stephens (Instructor in Fruit Culture), Cairns; C. C. Barth (District Inspector of Stock), Townsville; S. C. Smith (Inspector of Stock), Mackay; and L. J. C. Mullen (Fauna Protector), Rockhampton.

Mr. A. James, loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Inspector under *The Diseases in Plants Acts* in place of Mr. J. F. Whitby, resigned.

Messrs. F. P. Walsh and R. H. Sanders, of Eagle Heights, have been appointed honorary rangers under *The Native Plants Protection Act* and honorary protectors of fauna.

Mr. J. Shilkin, veterinary surgeon (milk investigation), has been appointed also an inspector under *The Diseases in Stock and Dairy Produce Acts.*

Miss M. E. B. Power has been appointed an assistant cane tester for the current sugar season at Moreton Mill, Nambour, in place of Mr. A. Byrne, resigned.

Mr. W. D. Scott (Green Island) has been appointed an honorary ranger under *The Native Plants Protection Act* and honorary protector of fauna.

Mr. J. W. McMullen (Rockhampton) has been appointed an honorary protector of fauna.

Constables F. S. Tapsall (Cooroy) and D. Chapman (Malbon) have been appointed also inspectors under *The Slaughtering Act.*

Avocado Levy and Extension of Pineapple Levy.

A Regulation has been issued under *The Fruit Marketing Organisation Acts* empowering the Committee of Direction of Fruit Marketing to make a levy on all avocados marketed from 15th July, 1941, at the following rate:—

(1) On all avocados sold, consigned, or delivered by rail to any agent, person, firm, company, or corporation in Queensland at the rate of 3s. 4d. per ton with a minimum of 1d.;

(2) On all avocados sold, consigned, or delivered otherwise than by rail to any Queensland railway station to any agent, person, firm, company, or corporation at the rate of 1d. per case.

An amendment of this Regulation has also been approved, and this provides that the levy shall be at the rate of 6s. 8d. per ton instead of 3s. 4d. per ton.

A further Regulation has been issued under the abovementioned Acts extending the Pineapple Levy Regulation, which came into operation in August, 1940, for a further period from 25th August, 1941, to 31st December, 1941. For the period of the extension, the Committee of Direction has reduced the levy on fresh pineapples from 2d. to 1d. per case.

Fauna Sanctuary.

An Order in Council, issued under *The Fauna Protection Act of* 1937, declares the property of Mr. A. H. Wheatley, "Happy Days," at Mission Beach, via Tully, to be a sanctuary for the protection of fauna. Mr. Wheatley has been appointed an honorary protector for the sanctuary.

Fruit Marketing Organisation Acts.

Regulations have been issued under *The Fruit Marketing Organisation Acts* constituting the electorates for the purpose of electing members of the various sectional group committees. These include the banana, pineapple, citrus, deciduous, and other fruits sectional group committees.

Herbert River Cane Levy.

A regulation has been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Herbert River District Cane Growers' Executive to make a further general levy for administrative purposes on suppliers of sugar-cane to the Macknade and Victoria mills at the rate of ½d. per ton.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production records for which were compiled during the month of July, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD, 350 LB.).				
Alfa Vale Model 2nd (328 days)	W. H. Thompson, "Alfa Vale," Nanango	18,529·8	903·901	Reward of Fairfield
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Ventnor Mab	C. W. Black, "Ventnor," Kumbia	7,876·78	342·419	Kyabram Twiney Boy
Newhaven May (235 days)	E. O. Jeynes, "Newhaven," Raceview	6,132·0	282·121	Croyden Magnet
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Merrivale Buttercup 9th (257 days)	W. Soley, Malanda	8,086·35	250·190	Greyleigh Honorarium
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Carn Brea Sunrise	A. T. Paull, Bowenville	6,274·94	296·730	Laguna Emblem
Murray Bridge Pansy 2nd (250 days)	A. T. Paull, Bowenville	5,379·75	255·955	Murray Bridge De Valera
Carn Brea Angel	A. T. Paull, Bowenville	6,021·3	251·403	Laguna Emblem
Parkview Fussy 67th (243 days) (Died)	J. Crookey, Allora	5,695·05	245·585	Parkview Radiant
Merrivale Bonnie 7th	W. Soley, Malanda	7,713·75	243·719	Greyleigh Gleaner
Murray Bridge Nancy	A. T. Paull, Bowenville	5,334·76	236·316	Murray Bridge De Valera
JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Vanette of Linwood	F. W. Kath, Moffatt, *via* Dalby	9,155·23	550·785	Aerofoil of Banyule
Kathleigh Lady	F. W. Kath, Moffatt, *via* Dalby	9,396·35	528·473	Retford King's Thorn
Kathleigh Promise	F. W. Kath, Moffatt, *via* Dalby	9,544·07	523·269	Retford Royal Atavist
Pride of Linwood (365 days)	C. W. Barlow, Irvingdale road, Dalby	8,639·3	491·304	Listowel Royal Heir
Langside Prim	S. H. Caldwell, Walker's Creek, Bell	9,084·04	466·585	Masterpiece Yeribee of Brucevale
Kathleigh Faith	F. W. Kath, Moffatt, *via* Dalby	8,369·52	464·546	Retford Royal Atavist
Trinity Lady Hopeful	J. Sinnamon and Sons, Moggill	6,888·13	366·359	Somehope (Imp.)

	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Kathleigh Ettie	**F. W. Kath, Moffatt, *via* Dalby**	8,961·48	511·494	**Retford King's Thorn**
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Inverlaw Golden Belle	R. J. Crawford, Inverlaw, *via* Kingaroy	8,173·02	456·880	Oxford Royal Lad
Inverlaw Patsy	R. J. Crawford, Inverlaw, *via* Kingaroy	8,221·73	456·159	Oxford Royal Lad
Kathleigh Beauty	F. W. Kath, Moffatt, *via* Dalby	8,500·26	450·354	Retford King's Thorn
Inverlaw Mabel	R. J. Crawford, Inverlaw, *via* Kingaroy	8,906·02	442·159	Oxford Royal Lad
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Inverlaw Phyllis	R. J. Crawford, Inverlaw, *via* Kingaroy	11,081·25	616·969	Oxford Royal Lad
Inverlaw Lady Cynthia	R. J. Crawford, Inverlaw, *via* Kingaroy	8,648·86	503·904	Carnation Buttercup 2nd's Prince 2nd
Kathleigh Mabel	F. W. Kath, Moffatt, *via* Dalby	7,662·25	405·897	Kathleigh Royal Flyer
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Gem Mabel	W. Bishop, Kenmore	8,436·77	422·92	Laces Volunteer of Ardroy
Rosedale Moolabin Mist 3rd	L. Sheehan, Innis Park, Bundaberg	5,465·41	302·590	Carnation Queens Duke
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Strathdean Favourite	S. H. Caldwell, Walker's Creek, Bell	5,813·25	378·346	Langside Noble Dreamer
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Kathleigh Daffodil	F. W. Kath, Moffatt, *via* Dalby	7,656·45	418·521	Retford King's Thorn
Erceldene Pretty Lass	C. W. Barlow, Irvingdale road, *via* Dalby	5,148·54	272·928	Navua Bontillcere's Lad
Holmsdale Cora	J. Cummings, Nerang	5,093·75	256·806	Richmond Thor
Fauvic Firefly	H. Cochrane, Fauvic, Kin Kin	4,887·4	249·98	Fauvic Nightlight
Trinity Handsome Belle	J. Sinnamon and Sons, Moggill	4,931·53	244·06	Trinity Cute Prince 3rd
Lermont Fancy	P. H. Schull, "Woodview," Oakey	4,472·35	237·934	Hillgrove Maurice

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Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown row crops to keep down weeds and maintain a surface mulch, for rain falling on a caked surface soil may not penetrate to any great depth. To check losses of soil during summer storms, all row crops should be sown at right angles to or athwart the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, may be continued and sweet potatoes planted out.

On the western Downs and Maranoa, farmers are advised to sow Sudan grass, which has proved itself in recent years as a summer crop, whether for grazing, hay, or silage.

As a summer-growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum) cowpea should be considered. Suitable varieties are black, Poona, and groit. October is a good month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub "burns," or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed to the acre, adding white clover seed at the rate of 2 lb. to the acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed. No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub "burn." From 4 to 6 lb. of tested seed to the acre usually provides a good stand.

Where wheat crops are being converted into hay, these should be cut a few days after the flowering stage as they then contain the maximum nutritive value, the nutriment at that stage being spread evenly throughout the plant. A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour.

As harvesting becomes general during November, all necessary machinery should be given a complete overhaul, in order to avoid stoppages at a critical period.

WOMEN ON THE LAND IN WAR TIME.

In these days, women on the land in war-time Britain have a hard row to hoe in more senses than one. Farm work demands skill and knowledge, and is often so heavy that the British farmer has been doubtful about taking on women as farm workers. However, there are about 10,000 girls of the British Land Army now taking the place of men on farms, and they have proved their value. They are generally employed in specialised branches—poultry, dairy, young stock, fruit and market gardening—but a tour of the British countryside showed them handling many heavier jobs—cranking a tractor, "scruffing" calves, and other jobs calling for strength, and they were doing them automatically as if physique counted for nothing. And, more than that, they are taking real war risks without turning a hair. One now famous area in East Kent was being sprayed with shrapnel with tractors well within what the gunner calls the "cone of dispersion." None of the girls driving the tractors asked for a transfer. Instead, they applied for tin hats—and got them—and went on ploughing.

Women in the British villages are saving cargo space by making jam. The country women's associations are all busy on the job. Jam-making centres have been set up in village halls, in empty garages, sometimes in farm kitchens, and every woman lends a hand picking, preparing the fruit, and making jam. Reckoning the average British family now eats 3 lb. of jam a week, these village women, during six months, made enough jam to supply, roughly, 250,000 families for a year.

There is no doubt that one of Britain's greatest assets is her genius for improvisation—doing the unexpected in the unusual way, so to speak. Centuries of freedom have accustomed our women to think for themselves, and from amidst all the destruction and confusion of war they are taking their full share of the national responsibilities. No doubt, the fine attributes of the feminine mind, the eye for detail, and dislike for waste, are proving of value beyond estimate in doing the nation's housekeeping from day to day.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is usually a dry month over the greater part of Queensland; consequently the advice given in the notes for August and September on the necessity of thorough cultivation to retain moisture is again emphasised. Thorough cultivation of all orchards, vineyards, and plantations is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch.

All newly-planted trees should be watched carefully; if they show the slightest sign of scale or other pests they should receive attention at once.

Bananas.

In the warmer districts, banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done before the winter, young plantations planted in the previous season should be desuckered without delay. Plants desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation there will be several seasons during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care should be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. to the acre. Keep down weeds with a dutch hoe, but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are cut or disturbed with horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus prevent much fungus trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

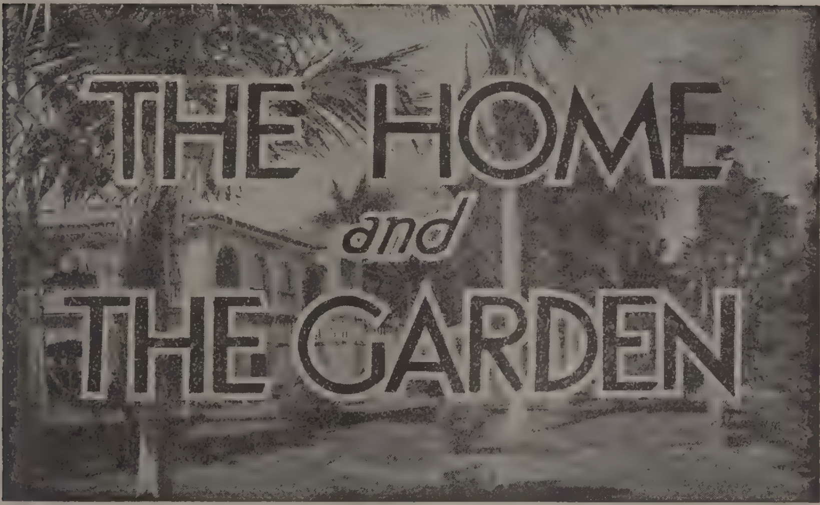
MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment the orchard and vineyard get the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards should be kept loose. In the western districts, irrigation should be applied whenever necessary, but growers should not rely on irrigation alone, and should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch to prevent surface evaporation.

All newly-planted trees should be looked after carefully and only permitted to grow the branches required. All others should be removed as soon as they appear. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, they should be dealt with at once by the use of such remedies as black leaf forty, bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, for if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and afterwards at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer localities, a careful check should be kept on any appearance of the fruit fly, and, if found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving much of the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with bordeaux mixture, likewise grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot—the first indication of downy mildew—appears on the top surface of the leaf. Spraying with bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop; but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers may be certain that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is necessary, for if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

Plate 88.
INTERIOR OF FRUIT MARKET, SYDNEY.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

YOUR CHILDREN AND THE SUNSHINE.

THE other day I was reading a fairy story to my small niece—you all know the one where the fairies appear and present the new baby with gifts, beauty and riches, and suchlike things.

Some babies are still presented with these gifts, but there is one gift that every Queensland baby receives, and I do not think that mothers appreciate it nearly as much as they should—the sunshine.

In our various articles you have learnt some of the reasons why so many babies born healthy die in the first year or two of their lives or grow up into children who are always sickly and ailing. Amongst the causes of death are the respiratory infections—that is, infections of the parts of the body concerned with breathing—nose, throat, and lungs. Diseases caused by these infections include the common cold, whooping cough, bronchitis, and pneumonia. We are all so used to seeing people around us with colds, &c., that we have begun to believe that they are not of much importance, that everyone gets them, and it cannot be helped. We must not look at it in this way. In our effort to save our babies the prevention of these diseases is a serious consideration. Of course, while we live in cities and are crowded together in trams, trains, and picture shows, we cannot avoid coming into contact with the germs which cause these diseases. As we told you in our article last month, the germs are sprayed into the atmosphere by children, and alas! sometimes by grown-ups also, coughing and sneezing carelessly and without using a handkerchief.

The best thing to do, therefore, is to start a physical fitness campaign in our own homes and develop our own physical health and that of our babies and children, so that our bodies will be able to resist these germs. This is where our wonderful sunshine can help us quite a lot.

Our spring weather is beginning, so let us think of the ways in which we can use our sunshine to keep our children fit and enable them to build up strong, healthy bodies.

For very many years we have known that sunlight destroys germs: it is the cheapest and safest antiseptic in the world. So open wide your windows and doors and let the sunlight in! Let it have free access to your children's play pens, cots, and play grounds, and destroy these germs of colds and other ills. Some mothers may be afraid that the strong chemical action of the sunlight may cause carpets and curtains to fade, but surely it is better that carpets should fade than that the little ones should lose their colour.

Another value of sunlight which was discovered more recently is that in connection with the cure of rickets and tuberculosis. During the course of treatment it was found that children suffering from these diseases could be cured by exposing their bodies to sunlight for some hours each day, by providing them with food of the right kind, and by giving them the necessary rest and sleep. Surely in a country like ours, where we can grow all the necessary foodstuffs, and where most of the days are bright and sunny, we should not have to cure these diseases at all but should be able to prevent them.

Sunlight is a most important factor in helping the body to make use of the minerals supplied in the food. In our talk on "Baby's Teeth" last year you were told that baby's teeth and bones are built up of two minerals—lime and phosphorus—and a list of the foods containing a good amount of these minerals was given.

However, before the body can use these minerals properly it is also necessary to have a supply of a vitamin known as Vitamin D. We get this vitamin in certain food, such as cod and other fish liver oils, and also to a smaller degree in eggs and butter and milk, but it can also be formed by the action of the sunlight on the skin.

So you see that sunbathing is not used just to provide the skin with a nice coat of tan during the summer holidays, but properly carried out can be a most useful means of giving our children healthy bodies with strong well-built bones and muscles, and a good resistance to disease. Rickets is a disease which causes the bones to remain soft and also affects the nervous system.

Fortunately, we do not find in Queensland the many cases of chronic chest troubles and serious rickets which are found in England and other countries where the sunshine is not as constant as it is here, and where the smoke of factories in the larger manufacturing towns obscures the sunlight, or where very high buildings prevent it from reaching the city streets.

But our doctors tell us that some of our Queensland children suffer with a mild form of rickets and become very pale and lacking in tone. This is likely to happen to children who are brought up in flats which may be on the dark side of a building, and where there is no garden space, or it may happen in parts of the State where the rainfall is sometimes fairly continuous for days or even weeks at a time. Mothers could prevent their children developing this trouble by giving sunbaths regularly while the fine weather lasts, and even during the wet weather suitable shelters or parts of the house could be used for sun and air bathing when the weather does become fine for a few hours.

You see then that the sunshine is first of all Nature's builder—helping baby's body to use his food to the best advantage and to grow strong and resistant. Secondly, it is Nature's doctor, killing the disease germs which would harm our children, or helping to cure them when they do become ill. Next month we shall talk more fully about sunbathing and the method of carrying it out correctly.

You can obtain further advice on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM KITCHEN.

SHORTBREAD RECIPES.

Apricot Prune Shortcakes.

Ingredients: 2 level cups sifted self-raising flour, pinch of salt, 2 oz. butter, ¼ cup castor sugar, 1 egg, ½ cup milk, stewed or canned apricots and prunes, sweetened whipped cream.

Method: Sift flour and salt into basin, rub butter in lightly with fingertips, and add sugar. Moisten with beaten egg and milk, mixing evenly, and place in buttered recess cakepan (about 8 inches square). Bake in moderately hot oven for twenty to twenty-five minutes, and lift on to cake cooler. Cut warm mixture into

two layers, spread with butter, then cover with apricots and stoned prunes, joining the cake layers. Top with more fruit, decorate with sweetened whipped cream, and serve as cake or dessert. Peaches, bananas, strawberries, blackberries, loganberries, apples, rhubarb, raspberries, pineapple, or passionfruit may be used in the same way, and individual shortcakes may be similarly made.

Shortbread.

Ingredients: 3 oz. castor sugar, 7 oz. butter, pinch of salt, 9 oz. flour, 2 oz. rice flour, ½ teaspoon baking powder, citron peel or crystallised fruits.

Method: Sift sugar, salt, flour, rice flour, and baking powder on to marble slab or pastry board. Rub butter in lightly until mixture is crumbly, then knead until firm and smooth. Mould into two round flat cakes, pinch edges neatly, prick centres with fork prongs, mark into sections with knife, and bake on buttered trays in moderately hot oven for thirty to forty minutes until straw-coloured. Leave on trays until cold and crisp before storing in airtight containers.

Oaten Cheese Shortbread.

Ingredients: ½ lb. finely flaked oats or oatmeal, ¼ lb. self-raising flour, salt and cayenne, ¼ lb. finely grated cheese, 1 egg, paprika for sprinkling.

Method: Sift flour into basin, rub butter in lightly with fingertips, then add oats, grated cheese, and season with salt and cayenne. Mix with beaten egg to form a smooth short paste, press evenly into a buttered swiss roll pan, forming a thin layer, brush surface with milk or beaten egg, and sprinkle with paprika. Mark into finger-lengths and bake in moderately hot oven for twenty to thirty minutes. Cut into marked shapes, leave on tray until cold, then serve with curled celery or other savories.

Australian Shortbread.

Ingredients: 10 oz. rolled oats, ½ teaspoon salt, 4 oz. brown sugar, 4 oz. butter, 1 tablespoon golden syrup.

Method: Melt butter and syrup in saucepan, stir in sugar, salt, and rolled oats, mix well, and press into a buttered swiss roll pan, forming an even layer. Bake slowly in moderately hot oven for twenty to thirty minutes. Cut into required shapes while hot, leave on trays until cold, then store in airtight container.

Ginger Shortbread.

Ingredients: ½ lb. flour, ½ teaspoon baking powder, 1 teaspoon powdered ginger, 3 oz. sifted icing sugar, 4 oz. butter, 1 egg, ½ cup chopped preserved ginger, castor or icing sugar for sprinkling.

Method: Sift flour, salt, baking powder, powdered ginger, and icing sugar into basin and lightly rub in the butter. Moisten with beaten egg, forming a short paste. Knead until smooth, then press or roll to ¼-inch thickness. Place on buttered swiss roll tray, sprinkle with chopped ginger, and cut into triangles or other shapes. Bake slowly in moderately hot oven, until firm and lightly coloured, then sprinkle while hot with castor or icing sugar, and leave on trays until crisp and cold.

Chocolate Shortbread.

Ingredients: 3 oz. sifted icing sugar, 6 oz. butter, 1 egg, 3 tablespoons hot milk, 1 dessertspoon cocoa, 10 oz. flour, ½ teaspoon baking powder, pinch of salt, 2 tablespoons brown sugar, ½ cup seeded raisins, ½ cup chopped nuts or ground almonds.

Method: Mince the seeded raisins and mix with brown sugar and ground almonds or chopped nuts. Blend cocoa with hot milk and leave to cool. Cream butter and sifted icing sugar, gradually add beaten egg, milk, cocoa, sifted flour, baking powder, and salt. Knead until smooth and roll half the mixture thinly, to line a buttered swiss roll tin. Spread evenly with thin layer of raisin filling, cover with second portion of thinly rolled paste. Brush surface with milk or beaten egg, and either sprinkle with chopped nuts before baking or cover with thin layer of icing after cooking. Bake in moderately hot oven for about twenty minutes, cut while hot, and leave on trays until cold.

Shortbread Squares.

Ingredients: 7 oz. flour, pinch of salt, 1 oz. cornflour, 5 oz. butter, 3 oz. castor sugar, 1 egg, 2 oz. blanched chopped almonds.

Method: Cream the butter and sugar, add egg yolk, sifted flour, salt, and cornflour, mixing to a firm smooth paste. Press or roll and place in buttered swiss roll pan, forming a thin even layer. Pinch edges with thumb and finger, brush surface with egg white, and sprinkle with prepared almonds. Mark into small squares, bake slowly in moderately hot oven until firm and lightly coloured, then cut while hot and leave on tray until cold and crisp.

STRAWBERRY RECIPES.

Steamed Strawberry Sponge Pudding.

Mix together 5 oz. self-raising flour and a pinch of salt. Cream ¼ lb. each of butter and sugar, stir in two well-beaten eggs, and then gradually add a little milk. Sift in the flour. Have ready buttered a pudding basin or mould in which ½ lb. fresh strawberries have been packed, generously sprinkled with sugar. Pour in the sponge mixture, cover basin tightly and steam for 1½ hours. Serve with a sweet white sauce to which a few crushed berries have been added.

Strawberry Charlotte Meringue.

Line a buttered pie dish with fingers of sponge cake. Pour in on top of them ½ lb. freshly sieved strawberries, sweetened to taste. Then cover with the very stiffly beaten whites of three or four eggs, sprinkle with castor sugar, and bake in a very slow oven until the meringue is slightly browned. Serve with custard made from the egg yolks or with cream if available.

Pineapple Strawberry Meringue.

Peel large pineapple, with sharp knife cut out hard core entirely. Fill cavity with fresh strawberries, previously hulled, washed, and sprinkled with sugar. Place pineapple on side lengthwise in fireproof dish, cover it with meringue made by whipping whites of 4 eggs with 4 tablespoons sugar till stiff. Place in moderate oven, lower heat, and cook slowly till meringue hardens—about 1 hour. Serve cold with cream.

Strawberry Marmalade.

Take firm, ripe strawberries, wash and pick off stalks, then to each cup strawberries add cup sugar. Place in layers in bowls, putting thick layer strawberries first, then sugar, and so on until strawberries all are used. Allow stand two days, then put in preserving pan, cook gently until marmalade is thick. Remove from fire, add juice lemon to each 4 cupfuls marmalade. When cooked and bottled, the strawberries will be surrounded by thick, clear jelly.

Strawberry Shortcake.

For shortcake: 9 oz. self-raising flour (or plain with 4 level teaspoons baking powder); ½ level teaspoon salt, 3 dessertspoons castor sugar, 3 oz. butter, 1 egg, about ½ gill milk. Sift flour, salt into basin, rub in butter, add sugar. Beat up egg, stir it into mixture with sufficient milk to make soft dough. Grease deep sandwich tin. Turn dough on to lightly-floured board, roll to size of tin; place dough in tin, pressing lightly to make it fit. Bake in fairly hot oven about half-hour. When cooked turn out carefully, leave on cake rack till cold. For filling: 1½ gill cream, about 1 lb. strawberries, ¼ lb. castor sugar, vanilla flavouring. Hull strawberries, cut in halves with stainless knife. Dredge with castor sugar; let stand while cake is cooking and cooling. Whisk cream till stiffens, sweeten with little sugar and flavour with vanilla. Split shortcake in half, spread layer cream over two cut sides, cover lower half with some of the prepared strawberries, put other half cake on top. Spread top with remainder cream, decorate with the rest of the strawberries.

IN THE FARM GARDEN.

IMPROVING SPRING FLOWERS.

DR. D. A. HERBERT.

AT this time of the year many of the spring annuals are in full bloom or putting out their buds, and a little attention will not only improve the individual size and quality of the flowers but prolong the flowering period. Briefly, there are three main ways of doing this—first, feeding the plants to provide for the increased drain on their resources during the flowering period; second, the removal of spent flowers so that the good material which would have gone to seed production is diverted to a new crop of flowers; and third, protection against disfigurement and destruction by pests.

Liquid manure is simply plant food in a soluble form and which when put round a plant can be taken up and used almost immediately. All plant foods from the soil are taken up in solution, but some of the fertilizers are only slowly dissolved

and are slow in their action—bonedust as an example. Now, when a plant is coming into bud there is a considerable drain on its resources, and the provision of some quickly absorbed fertilizer is of great benefit. You will see this if you feed up some plants and leave a few alongside without manure for comparison.

The first thing is to decide on the liquid manure. Floraphos is excellent, but rather expensive. The three from which the choice is usually made are sulphate of ammonia, soot, and animal manure. Sulphate of ammonia is reasonably cheap, keeps indefinitely, and has no smell. A dessertspoon to a gallon of water makes a good nutrient solution, to be put round the plants at the rate of a gallon to the square yard, and the dose can be repeated at weekly intervals. The action of sulphate of ammonia is improved by the addition of about a third of the quantity of sulphate of iron—say a dessertspoon of sulphate of ammonia and a small teaspoon of sulphate of iron to the gallon. Sulphate of iron leaves a rust stain on clothing, so should be handled carefully.

Soot is another useful material, if it can be obtained. It can be spread round the plants in the dry form, when it acts as a deterrent for slugs, and the fertilizing materials are washed into the soil when it is watered. The most convenient way, however, is to soak a couple of dipperfuls in a bucket of water for a day or so. It is best put in a bag with a stone, as it does not sink very well when it is dry. Much of the value of soot lies in the ammonia it contains. Its disadvantage is that it is dirty stuff to handle; so this can be the consolation of those who cannot obtain it.

The orthodox liquid manure used by home gardeners is of animal origin—urine or manure in suitable dilution. Cow and sheep manure are the safest. They are soaked in a barrel or a bucket—about a pound of manure to the gallon—and left for about a week. For use the liquor is diluted down until it is about the colour of weak tea. For delicate plants such as maiden hair fern or cinerarias the solution can be made weaker, but the colour of weak tea generally indicates a suitable strength for ordinary annuals. There are two disadvantages of liquid animal manure—its smell and its attractiveness to flies; but there is no doubt about its beneficial effect on plants. It should be kept covered while it is fermenting. Urine has much the same effect and should be diluted 1 in 4 or 5 and applied at the rate of a gallon to the square yard. Fowl manure is much more concentrated than the others and should be diluted down much more.

So much for liquid manure. The second method of improving the flower crop is the systematic removal of spent flowers, and nothing needs to be said about that. If you are saving seed for next year, the best plants should be marked while they are in flower, as it is only by selection that the best varieties can be maintained. The casual collection of any seed that happens to have been produced anywhere in the garden is often the cause of unsatisfactory future crops. The flowering period is the best time for marking for destruction any poor types that are bound to appear from time to time and to prevent their multiplying up in future years.

The third point is protection against pests. Many of our annuals can be grown to perfection and then ruined by one of the innumerable pests just as they are coming into flower. Slugs are amongst the most annoying of these things. They do their damage at night and are hard to locate in the daytime. Hand picking at night with the aid of a torch helps to keep them down, but it is a tedious way of spending an evening. Trapping or baiting is much more satisfactory. Slugs are very fond of bran, and if small heaps are put round their haunts and a damp board or brick or even an upturned flowerpot left nearby, they will have their final feast, like condemned criminals, and then camp under the prepared shelter, to be collected next morning. Much better than this, however, is slug bait. Some years ago the amazing efficiency of metaldehyde in poisoning slugs was discovered, and this method has superseded the older types of poison such as Paris Green. Metaldehyde can be bought from hardware stores under the name of Meta fuel—a white substance in the form of tablets. One tablet is crushed and mixed thoroughly with a cup of bran and small heaps (about an eggcupful) are left round the haunts of the slugs. In wet weather the bait needs a cover. Ready-mixed bait can be bought in packets, but is more expensive than the home-made material. Meta should be kept out of the way of children, as the white tablets might be mistaken for lollies. The bait is a specific for slugs and snails and is not of value for controlling insects.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1941.	July, 1940.
North Coast.	In.		In.	In.
Atherton	1·13	40	0·73	0·90
Cairns	1·55	59	0·47	0·94
Cardwell ..	1·37	69	0·51	0·96
Cooktown ..	0·97	65	1·20	2·28
Herberton ..	0·88	55	0·53	0·63
Ingham	1·67	49	0·52	0·63
Innisfail	4·77	60	1·86	3·98
Mossman Mill ..	1·27	28	0·98	0·27
Townsville ..	0·64	70	0·01	0·01
Central Coast.				
Ayr	0·69	54	0·25	Nil
Bowen	0·92	70	0·20	Nil
Charters Towers ..	0·64	59	0·06	Nil
Mackay P.O. ..	1·65	70	0·01	0·12
Mackay Sugar Experiment Station	1·44	44	0·01	0·11
Proserpine ..	1·54	38	0·06	0·03
St. Lawrence ..	1·37	70	0·28	1·45
South Coast.				
Biggenden ..	1·42	42	0·20	0·35
Bundaberg ..	1·86	58	0·12	0·67
Brisbane ..	2·19	89	0·64	0·32
Caboolture ..	2·41	65	0·24	0·78
Childers	1·73	46	0·17	1·08
Crohamhurst ..	2·95	48	0·33	2·18
Esk	1·94	54	0·35	0·27
South Coast—contd.	In.		In.	In.
Gatton College ..	1·40	42	0·48	0·11
Gayndah	1·48	70	0·10	0·81
Gympie	2·09	71	0·24	0·93
Kilkivan	1·51	60	0·25	1·21
Maryborough ..	1·95	70	0·23	1·11
Nambour ..	2·72	45	0·30	2·86
Nanango	1·67	59	0·41	1·15
Rockhampton ..	1·74	70	0·15	0·61
Woodford ..	2·35	54	0.36	0·86
Central Highlands.				
Clermont ..	1·05	70	0·40	Nil
Gindie	1·08	42	..	Nil
Springsure ..	1·19	72	0·18	Nil
Darling Downs.				
Dalby	1·72	71	0·75	0·43
Emu Vale ..	1·57	45	0·63	Nil
Hermitage ..	1·66	36	..	Nil
Jimbour	1·48	62	0·55	0·55
Miles	1·62	56	0·39	0·44
Stanthorpe ..	2·00	68	0·82	0·13
Toowoomba ..	2·07	69	0·97	0·16
Warwick ..	1·80	76	0·72	Nil
Maranoa.				
Bungeworgoral ..	1·32	27	..	Nil
Roma	1·43	67	0·21	0·15

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg		Points.	
Cooktown	..	77	64	80	10	53	13	120	10
Herberton	..	70	45	75	5	28	12	53	3
Rockhampton	30·16	74	49	81	3	41	25, 27	15	1
Brisbane	30·15	70	48	78	16	41	28	64	3
Darling Downs.									
Dalby	..	67	36	74	14	26	25	75	2
Stanthorpe	..	60	31	66	15	22·1	27	82	5
Toowoomba	..	62	43	68	16	35	23	97	5
Mid-Interior.									
Georgetown	30·10	81	47	85	3, 4, 5, 15, 16	29	12	Nil	..
Longreach	30·19	76	41	83	3, 4	34	12	Nil	
Mitchell	30·22	67	33	75	1, 4, 15	25	27, 28	47	1
Western.									
Burketown	..	81	50	90	20	38	12	Nil	..
Boulia	30·18	73	43	84	3	36	11	Nil	..
Thargomindah ..	30 20	67	39	74	14	32	11	..	..

ASTRONOMICAL DATA FOR QUEENSLAND
OCTOBER, 1941.
By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON. AT WARWICK.

Oct.	SUN.		MOON.	
	Rises.	Sets.	Rises.	Sets.
	a.m.	p.m.	p.m.	a.m.
1	5.33	5.53	2.10	2.42
2	5.32	5.53	3.7	3.25
3	5.30	5.53	4.1	4.4
4	5.28	5.53	4.55	4.42
5	5.27	5.53	5.48	5.17
6	5.26	5.54	6.41	5.52
7	5.25	5.55	7.32	6.27
8	5.25	5.56	8.24	7.6
9	5.23	5.57	9.15	7.44
10	5.22	5.57	10.5	8.24
11	5.21	5.58	10.55	9.9
12	5.20	5.58	11.43	9.55
13	5.19	5.59	nil	10.44
			a.m.	
14	5.17	5.59	12.29	11.37
				p.m.
15	5.16	6.0	1.15	12.32
16	5.15	6.1	1.58	1.29
17	5.14	6.1	2.41	2.28
18	5.13	6.2	3.23	3.30
19	5.12	6.2	4.6	4.33
20	5.11	6.3	4.50	5.39
21	5.10	6.4	5.36	6.46
22	5.9	6.4	6.25	7.52
23	5.8	6.5	7.17	8.58
24	5.8	6.6	8.12	10.1
25	5.7	6.6	9.9	11.0
26	5.6	6.7	10.8	11.53
27	5.5	6.7	11.7	nil
			p.m.	a.m.
28	5.4	6.8	12.5	12.41
29	5.3	6.9	1.2	1.25
30	5.2	6.9	1.58	2.5
31	5.1	6.10	2.51	2.42

Phases of the Moon.

5 October, Full Moon, 6.32 p.m.
13 ,, Last Quarter, 10.52 p.m.
21 ,, New Moon, 12.20 a.m.
27 ,, First Quarter, 3.4 p.m.

THE WORLD NEAREST THE SUN.

THE most interesting planet to watch during the early part of this month is Mercury. It appears high and bright above the western horizon at dark and does not set until nearly 8 o'clock. In England, few people ever see Mercury, and it is said, that the great astronomer Copernicus, who lived in Poland, never saw it. In high latitudes Mercury never appears far above the horizon. Mercury will be at its highest on 3rd October. Excepting Venus, it appears as the brightest "star" in the west. While looking at the planet, it is interesting to remember that this little world is but 3,000 miles in diameter. Its average distance from the sun being only 36 million miles, the solar heat there would be about seven times greater than it is here. As it always keeps one hemisphere toward the sun, as the moon does to the earth, the temperature on the sunny side would be sufficient to melt lead or tin. Little can be seen of Mercury, but it is thought to be in a very similar condition to the moon—without atmosphere, waterless (and, therefore cloudless, and with a surface of bare mountain peaks and plains of tumbled rock.

THE SHEPHERDS' STAR.

Well above Mercury is Venus, the Evening Star, sometimes called the Shepherds' Star by French sheepmen. It is the most brilliant of all the planets or stars. Venus was behind the sun in April, but is now coming toward us on its circular path round the sun. Next month it will appear at its highest in the sky, but although afterwards it will set earlier, its brilliancy will increase until after Christmas, when it will give enough light to throw shadows upon the earth in places far from city lights. Venus is much larger than Mercury. It is almost as large as the earth, and is sometimes our nearest neighbour. It is rather tantalising, however, to think that when at its nearest it is between us and the sun, and cannot be seen. When we can see it, its surface is always veiled with dense clouds so that we know nothing about its physical features. We do not know the length of its day or the position of its poles.

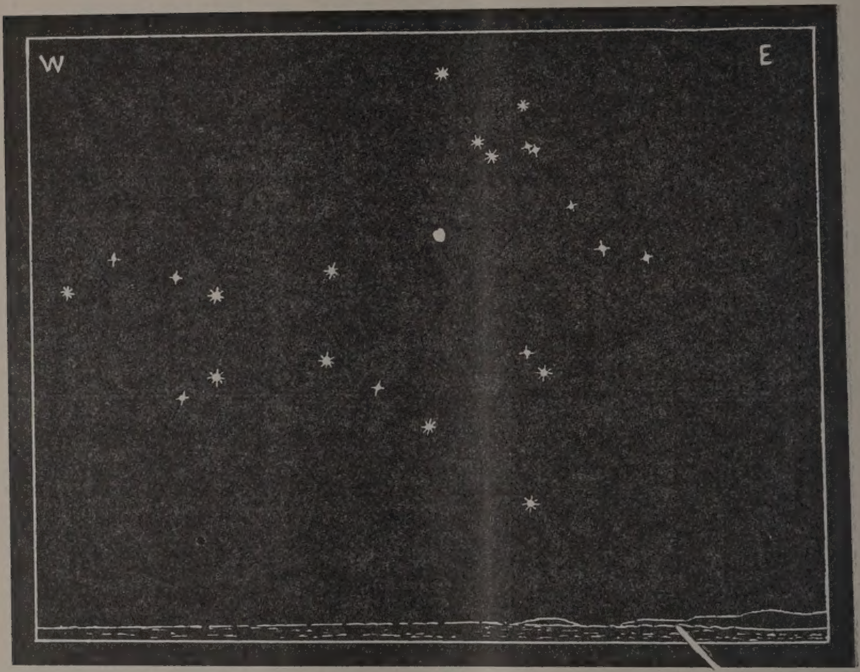
Beyond the earth, from the sun, is Mars. Beyond that is Jupiter, the first of the giant planets, and then comes Saturn. Saturn rises first, about 9.30 p.m., near the Pleiades. Two hours later Jupiter comes up, north of Orion. Both of these great planets are growing brighter as they approach the earth. Jupiter is 435 million miles from us at present. This great distance dwarfs, to the size of a star, a world so large that it could contain 1,300 earths. Like Venus, Jupiter is for ever enshrouded by dense clouds, but the clouds of Jupiter are always in a state of turmoil and are rich in colour. They are formed into belts north and south of its equator, and in some of them rows of black or white spots appear at times.

SHORT DAYS ON JUPITER.

There are markings on Jupiter which are semi-permanent, and from these the length of a day and night up there is found to be only about 10 hours.

Saturn is the next planet beyond Jupiter; the farthest world which can be seen by the naked eye. It is not as large as Jupiter, although 760 earths could be stowed away within its mighty globe. Saturn is much less brilliant than Jupiter, shining with a rather dull yellow light. Its globe has cloud belts, but at its great distance—787 million miles at the beginning of October—they appear very faint. What is seen well is Saturn's unique system of rings, which stretch outward, like a great platform, 48,500 miles wide. On such a platform, six worlds like ours could roll abreast. However, it is not solid, but probably composed of innumerable fragments of rock, all revolving round the great globe in their own orbits. Once upon a time, perhaps, these rings formed a moon which, for some reason moved in too near the great planet, whose enormous gravitational pull gradually dragged it to pieces.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.



LOOKING NORTH AT MIDNIGHT.

Midnight is far too late for most country folk to go star-gazing. But the Red Planet, Mars, will be on the meridian—a line from over the observer's head due north—at midnight, at its brightest and almost at its nearest to the earth on 10th October. It may be interesting, therefore, to show him and the neighbouring stars. As Mars reaches the meridian at midnight, he may be seen all the evening, with the surrounding stars, climbing the eastern sky, shining with his well-known ruddy hue, brighter than any of his neighbours. Mars is shown as a round dot a little above the centre of the picture. West of Mars is Pegasus, the Winged Horse, his curved neck stretching, almost to the edge of the picture. The four stars forming his body comprise the Great Square of Pegasus. From the north-east corner a line of three stars forms Andromeda. The constellation east of Mars is Cetus, the Sea Monster. Between Cetus and Andromeda are the two chief stars of Aries, the Ram.

MARS—OUR NEXT DOOR NEIGHBOUR.

Owing to the peculiar motion of the earth and Mars, it is only once in nearly two years and two months that he comes into opposition to the sun. Mars will be at its nearest to us on 3rd October when the distance will be 38,133,000 miles. Sometimes the Red Planet comes within 34 million miles; that happened in 1924. He came fairly close in 1938, within 36½ million miles. Mars is 4,215 miles in diameter, but at this great distance he only appears as a point of reddish light. In a small telescope, however, a distinct disc is seen; in large telescopes markings appear and on photographic plates much fine detail is imprinted. At the 1938 opposition, 8,000 plates were taken with a special camera and the 27-inch refracting telescope, at the observatory at Bloemfontein. A great amount of detail was found upon the plates and some of the features seem to have changed in shape from the previous opposition. It is in this way that astronomers keep an eye on our neighbouring world. Mars is the only planet whose solid surface we can study, as its atmosphere is, to a large extent, free of clouds. From these markings the Martian day is found to be 24 hours 37 minutes.

Girdling the planet, roughly within its tropics, are irregular grey or greenish regions; most of the remainder of the planet being of a reddish hue, which has caused Mars to be called the Red Planet.

MELTING SNOWFIELDS.

At each pole there are white caps, quite likely of snow. These polar caps dwindle as the Martian spring advances, and sometimes disappear toward the end of the summer. The reddish regions are thought to be sandy deserts and are almost featureless. The most interesting are the greenish tinted parts which girdle the planet. Much detail, considerable seasonable changes, and a wealth of colour are observed in large areas. According to some astronomers these seasonable changes are very similar to what might be expected from the seasonal surge and decline of life in vegetation. If it is vegetation, it may be very different to what we know upon the earth, perhaps only a smear of lichen upon the Martian rocks, or it may be of more luxuriant growth. These darker areas were once thought to be seas, but it is fairly certain that there are no large bodies of water on the planet. Cloud or mist is sometimes seen and the dark areas have probably a moister climate than the reddish country. The world has an atmosphere in which clouds float, but it is not nearly as dense as ours, and it is considered that life, such as we know it, could not exist there. The temperature, even at the equator, is very cold. At midday a thermometer may rise a little above 50° Fahr., but at sunset it would drop below freezing point and the nights must be very cold indeed.